The EDISON ELECTRIC INSTITUTE BULLETIN

December 1953

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Farm Progress Via Research
Walter H. Sammis

Proposed Amendment to the Atomic Energy Act of 1946

Industry's Role in Atomic Era
Walker L. Cisler

Atom's Impact on the Industry
E. H. Dixon

Atomic Power in Ohio
Philip Sporn

Fair Utility Rates for All
Robert P. Briggs

ublished Monthly by Edison Electric Institute

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

August, 1952-1953

SOURCE AND DISPOSAL OF ENERGY—MONTH OF AUGUST

	1953	1952	%
GENERATION* (Net)			
By Fuel Burning Plants	30,043,433,000	25,885,255,000	+16.1
By Water Power Plants	8,453,595,000	8,515,172,000	− 0.7
Total Generation	**38,497,028,000**	**34,400,427,000**	**+11.9**
Add—Net Imports Over International Boundaries	111,727,000	145,635,000	−23.3
Less—Company Use	139,719,000	113,363,000	+23.2
Less—Energy Used by Producer	854,477,000	1,072,038,000	−20.3
Net Energy for Distribution	**37,614,559,000**	**33,360,661,000**	**+12.8**
Lost and Unaccounted for	4,583,830,000	4,562,736,000	+ 0.5
Sales to Ultimate Customers	**33,030,729,000**	**28,797,925,000**	**+14.7**

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of August 31			
Residential or Domestic	41,497,272	40,182,263	+ 3.3
Rural (Distinct Rural Rates)	1,619,395	1,693,007	− 4.4
Commercial or Industrial:			
Small Light and Power	5,809,082	5,621,990	+ 3.3
Large Light and Power	272,482	256,956	+ 6.0
Other Customers	158,974	156,647	+ 1.5
Total Ultimate Customers	**49,357,205**	**47,910,863**	**+ 3.0**
KILOWATTHOUR SALES—During Month of August			
Residential or Domestic	7,546,233,000	6,656,836,000	+13.4
Rural (Distinct Rural Rates)	1,180,159,000	1,064,546,000	+10.9
Commercial or Industrial:			
Small Light and Power	6,253,116,000	5,585,934,000	+11.9
Large Light and Power	16,583,413,000	14,108,354,000	+17.5
Street and Highway Lighting	283,402,000	262,290,000	+ 8.0
Other Public Authorities	757,028,000	673,497,000	+12.4
Railways and Railroads:			
Street and Interurban Railways	210,412,000	230,015,000	− 8.5
Electrified Railroads	160,825,000	171,006,000	− 6.0
Interdepartmental	56,141,000	45,447,000	+23.5
Total To Ultimate Customers	**33,030,729,000**	**28,797,925,000**	**+14.7**
Revenue from Ultimate Customers	**$580,125,700**	**$512,854,100**	**+13.1**

RESIDENTIAL OR DOMESTIC SERVICE

AVERAGE CUSTOMER DATA—For 12 months ended August 31			
Kilowatthours per Customer	2,289	2,119	+ 8.0
Average Annual Bill	$63.18	$58.70	+ 7.6
Revenue per Kilowatthour	2.76¢	2.77¢	− 0.4

* By Courtesy of the Federal Power Commission.

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The objectives of the Edison Electric Institute are:

The advancement in the public service of the art of producing, transmitting, and distributing electricity and the promotion of scientific research in such field.

The ascertainment and making available to the members and the public of factual information, data, and statistics relating to the electric industry.

To aid its operating company members to generate and sell electric energy at the lowest possible price commensurate with safe and adequate service, giving due regard to the interests of consumer, investor, and employee.

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December, 1953

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CONVENTIONS AND MEETINGS

1953

DECEMBER

1- 2 EEI Street Lighting Committee, Dayton, Ohio
2- 3 EEI Commercial Lighting Committee, Detroit, Mich.
3- 4 EEI Market Development and Electrical Applications Committee, Washington, D. C.
3- 4 EEI Home Service Committee, Indianapolis, Ind.
3- 4 EEI-AGA Customer Accounting Committee, Netherland Plaza Hotel, Cincinnati, Ohio.
4 PIP Inter-Regional Committee, Norfolk, Va.
7- 8 EEI-AGA Accounting Conference Planning Committee, AGA Conference Room, New York, N. Y.
9 EEI Financing and Investor Relations Committee, EEI Headquarters, New York, N. Y.
10 EEI-AGA Customer Relations Committees, Mayflower Hotel, Washington, D. C.
10-11 EEI Industrial Power and Heating Section, Sheraton Hotel, St. Louis, Mo.
10-11 EEI-AGA Customer Collections Committee, Dayton Biltmore Hotel, Dayton, Ohio
10-11 EEI Commercial Cooking and Water Heating Committee, Tutwiler Hotel, Birmingham, Ala.
11 PIP Steering Committee, New York, N. Y.
14 EEI-AGA Accounting Employee Relations Subcommittee, Hotel Cleveland, Cleveland, Ohio.
16 ECAP Copy Group Meeting, Ayer Studio, New York, N. Y.
17 EEI Industrial Relations Committee, EEI Headquarters, New York, N. Y.
17-18 EEI Commercial Electrical Space Heating and Air Conditioning Committee, Canton, Ohio.

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JANUARY

14-15 EEI-AGA Depreciation Committee, EEI Headquarters, New York, N. Y.
18-19 EEI Accident Prevention Committee, Hotel Statler, Boston, Mass.
18-22 AIEE Winter General Meeting, New York, N. Y.
18-22 CEA Eastern Division Meeting, Quebec, Que.
18-22 National Industrial Electric Heating Conference, Industrial Electrification Council, Netherland Plaza Hotel, Cincinnati, Ohio.
21-22 EEI Industrial Relations Committee Joint Meeting with Personnel Administration Section, Southeastern Exchange and Southwestern Personnel Group, Hotel Roosevelt, New Orleans, La.
27-29 EEI-AGA Taxation Accounting Committees, Arlington Hotel, Hot Springs, Ark.

FEBRUARY

3 EEI Plant Accounting and Property Records Committee, Netherland Plaza Hotel, Cincinnati, Ohio.
3- 5 EEI Meter and Service Committee, Adolphus Hotel, Dallas, Texas.
4- 5 EEI Home Service Committee, New York, N. Y.
4- 5 EEI-AGA Accounting Conference Planning "Dress Rehearsal," Netherland Plaza Hotel, Cincinnati, Ohio.
4- 5 Missouri Valley Electric Association, Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo.
9-10 EEI Transmission and Distribution Committee, Hotel Cleveland, Cleveland, Ohio
11-12 PEA Transmission and Distribution Committee, Lord Baltimore Hotel, Baltimore, Md.

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FEBRUARY

11-12 EEI Commercial Cooking and Water Heating Committee, East Lansing, Mich.
11-12 PUAA Region 5 Meeting, Atlanta, Ga.
15-16 EEI Electrical Equipment Committee, Sheraton Cadillac Hotel, Detroit, Mich.
15-17 EEI Industrial Relations Committee Dinner Meeting in conjunction with AMA Mid-Winter Personnel Meeting, Chicago, Ill.
15-19 ASCE Atlanta Convention, Biltmore Hotel, Atlanta, Ga.
19-20 Controllers Institute of America, Southern Conference, Hotel Roosevelt, New Orleans, La.
25-26 PUAA Region 1 Meeting, Montreal, Que.

MARCH

1- 5 CEA Western Division, Winnipeg, Man.
18 EEI Industrial Relations Committee, EEI Headquarters, New York, N. Y.
21-23 Controllers Institute of America Eastern Conference, Sheraton Park Hotel, Washington, D. C.
22-24 Southeastern Electric Exchange 21st Annual Meeting, Boca Raton Hotel, Boca Raton, Fla.
25-26 Oklahoma Utilities Association Annual Convention, Biltmore Hotel, Oklahoma City, Okla.

APRIL

7- 9 Missouri Valley Electric Association Engineering Conference, President Hotel, Kansas City, Mo.
7- 8 Pacific Coast Electrical Association, Administration Services Section, Hotel Claremont, Berkeley, Calif.
8- 9 IES Southern Regional Conference, Roosevelt Hotel, New Orleans, La.
11-14 IES Southwestern Regional Conference, Rice Hotel, Houston, Tex.
12-14 EEI-AGA Accounting Conference, Hotel Statler, Boston, Mass.
15 EEI Industrial Relations Committee, Netherland Plaza Hotel, Cincinnati, Ohio
15-16 IES Inter-Mountain Regional Conference, Denver, Colo.
19-20 IES South Pacific Coast Regional Meeting, Museum of Art, San Francisco, Calif.
22-23 IES Pacific Northwest Regional Meeting, Benjamin Franklin Hotel, Seattle, Wash.
28-30 IES Canadian Regional Meeting, King Edward Hotel, Toronto, Ont.

MAY

2- 5 EEI Purchasing and Stores Committee, Hotel Roosevelt, New York, N. Y.
3- 4 IES Great Lakes Regional Meeting, Sheraton Cadillac Hotel, Detroit, Mich.
13-14 PUAA Annual Convention, Hotel Statler, Boston, Mass.
19-21 Pacific Coast Electrical Association Annual Convention, Hotel Del Coronado, Coronado, Calif.

JUNE

1- 4 EEI ANNUAL CONVENTION, Atlantic City, N. J.
3- 5 Controllers Institute of America Western Conference, Empress Hotel, Victoria, B. C.
14-19 ASCE Convention, Chalfonte Haddon Hall, Atlantic City, N. J.
17-19 IES Midwestern Regional Meeting, Hotel Jefferson, St. Louis, Mo.
24-26 CEA Annual Convention, Murray Bay, Quebec, Que.
27-30 Michigan Electrical Association Annual Convention, Grand Hotel, Mackinac Island, Mich.

The EDISON ELECTRIC INSTITUTE
BULLETIN

Progress in Farm Electrification Through Research

Walter H. Sammis
President, Edison Electric Institute

An address before the National Farm Electrification Conference, Washington, D. C., October 27, 1953

ALL of us—suppliers of electricity, equipment manufacturers, farm organizations, the universities and colleges, farm publications and the U. S. Department of Agriculture—can derive considerable satisfaction from the progress of farm electrification to date. Our cooperative efforts have enabled the farmer to produce more with less manpower. But much remains to be done.

When Thomas A. Edison invented the incandescent lamp in 1879 and followed it in 1882 with the world's first power station in New York City for the production and distribution of electricity, he brought to practical reality the results of years of human curiosity, experimentation, courage, and achievement. He started a new industry which has helped bring about phenomenal changes in our civilization.

Most recent figures available show that with less than 7 per cent of the earth's population, the United States produces 42 per cent of the world's electricity supply. Our electricity per capita was 2,984 kwhr in 1952, or twice the per capita production in Great Britain, two and one-half times that in West Germany, three times that in France, and over five times that in Russia. Last year's per capita figure of 2,984 kwhr in the United States compares with 1,247 in prewar 1939, an increase of 140 per cent.

The farmer has been an important beneficiary of this electrical progress. In his home can be found the same labor-saving, comfort-producing electrical facilities that are owned by his city cousin. An excellent selling job has been done here. On the farm itself, while electricity has done much to lift burdens from the farmer's shoulders, admittedly much research remains to be done before electricity's contributions to agriculture generally can be considered comparable to those made to industry.

Interest in the possibilities of applying electricity to agriculture actually antedate Edison's invention of the lamp. The October 13, 1906, issue of *Electrical World* reported that in 1878 "the first serious experimental use of electric power was for plowing, and that the first real installation in regular operation was for handling beets in a sugar factory."

While its results are clouded in obscurity, we are reasonably certain that the first practical use of electricity in connection with agriculture took place about 1898 on the system of the Pacific Gas & Electric Co. in California in the pumping of water for irrigation purposes. The idea soon spread to Oregon and other parts of the West. In 1910 the Rochester (N. Y.) Railway & Light Co. reported farm sales of electricity for irrigation, and the utility serving Poughkeepsie, N. Y., had just extended a 2,500-v distribution line to serve 35 farmers.

In this same year of 1910 growing interest in the possibilities of farm use of electricity prompted the organization, by the National Electric Light Association, a trade association of the electric utility companies, of a Committee on Electricity in Rural Districts to assemble information on the subject from different parts of the country and to establish contacts with agricultural colleges. The committee found 44 areas in 22 states in which farms were receiving electric service. Unfortunately the number of farms served was not listed. In 1912 this committee issued a report, listing 50 electrical uses for the farm home, 30 applications of electric motors to barn and field machinery, and 20 uses in the farm dairy. Thus, it is evident that the electric utility companies have been active in farm electrification for many, many years.

In 1923 an important step was undertaken that gave real impetus to the farm electrification movement. A Committee on Relation of Electricity to Agriculture (CREA) was formed by the National Electric Light Association, American Farm Bureau Federation, American Society of Agricultural Engineers, United States Department of Agriculture, and others. Twenty-seven state committees were organized for the purpose of building a test farm-line project in each state to serve a group of farmers and to cooperate in the application of electricity to farm equipment.

The first experimental line under this program, I understand, was constructed near Red Wing, Minn., that same year by the Northern States Power Co. The line was 6.3 miles long and served 16 of the 19 farms along its route. Distribution was at 2,300 v, single phase, using iron messenger wire. Later all-copper construction was substituted and in 1926 the voltage was raised to 6,900. In 1924, its first year of operation, the farm customers

used an average of 1,848 kwhr. In 1927 the average use increased to 3,444 kwhr. By mid-1928 a total of $75,000 had been invested in the project by the various contributing agencies, including equipment loaned by manufacturers.

Other experimental lines were soon constructed in New Hampshire, Michigan, Wisconsin, South Dakota, Iowa, Kansas, Illinois, and Ohio.

The Ohio test line was built in 1926 by a predecessor of the Ohio Edison Co. It was 5.9 miles long and operated at 6,600 v. Thirteen of the 22 farmers along the route took service and cooperated in the various studies and tests made jointly by the East Central Division of the National Electric Light Association, Ohio State University, State Grange, and Farm Bureau.

The maximum number of electric devices used on any one of these Ohio farms was 21: seven in farm buildings and 14 in the farm home. The minimum number was six: four in farm buildings and two in the home. All of the equipment was loaned by manufacturers, and the Ohio Edison Co. set up a financing plan so that the farmers could buy the equipment at the end of the test. As a result, practically all of the equipment remained in service. In 1928 the average use by these farms was 1,352 kwhr.

An interesting aftermath of the establishment of this line was the development by one of the company's farm representatives, working in conjunction with a manufacturer, of the first off-peak electric water heater with baffles within the tank for supplying hot water in the farm dairy. A crude affair, it was the forerunner of the type of appliance in popular use today. In 1929 such water heaters were being used by 30 of the utility's customers in the Springfield area.

The pioneering efforts of Consumers Power Co. of Michigan are worthy of mention. This company now serves over 103,000 farms—more than any other utility in the country. In 1927 the company built a seven-mile experimental farm line near Mason, Mich., and Michigan State College agreed to do the research. There were 33 farms along the route, but only 12 farmers agreed to participate. As months passed and the word spread that the use of electricity measured by separate meters on the individual pieces of equipment proved that electricity was of economical assistance on the farm, interest was stirred up all over the state. Michigan State College, with financial assistance from Consumers Power Co. and The Detroit Edison Co., sent a demonstration truck throughout the rural areas to carry further the story of labor-saving electric equipment and appliances to the farmer and his wife. If space permitted, similar experiences in other states could be enumerated.

At the end of 1923, a total of 122,000 farms was receiving electric service in the 27 states, and 165,000 farms in the country as a whole. At the end of 1926, the 27 states had 227,500 farms using service—an increase of 105,500 farms, or 86.5 per cent in three years. It was estimated that for the country as a whole the figure had increased to between 300,000 and 350,000.

In 1927 CREA reported 100 electric companies with one or more employees specializing in farm electric service. Of these, 53 had established farm service departments.

Pioneer Projects

In 1931 CREA made a survey of activities to that year. A total of 211 investigations was found to have been stimulated by CREA; there were 491 active projects being carried on by colleges, universities, and the Department of Agriculture, 118 investigational activities by electric companies and commercial concerns, and 39 undertakings in private and other laboratories. Thus, in addition to working with local land-grant colleges and universities in many states, the electric companies were also engaged in independent research. These were some of the independent research projects:

Idaho Power Co.—electric dairy sterilizer, stock water heaters.

Northern States Power Co.—electric steam sterilizer in 40-cow dairy, milk refrigeration.

Pacific Northwest Public Service Co.—forced-draft hay dryer, irrigation from deep wells, agitator for recovering silt for use in hop fields, electric motor for onion topper, electric brooder, instantaneous dairy electric water heater.

Illinois Northern Utilities Co.—refrigeration of meats, 2-gallon electric water heater.

Florida Power & Light Co.—greenhouse heating, demonstration farm, irrigation for frost prevention, water table control for sugar growing, brooder cooling for Florida's seasonal hot weather periods.

Public Service Co. of Illinois—demonstration farm.

Puget Sound Power & Light Co.—electric steam sterilizer, wet mash mixer, poultry brooding, chicken scalder, poultry water warmers, stock water heaters.

The Detroit Edison Co.—two cooperating test farms, farm house heating, truck farm irrigation, machine for threshing of oats, manure unloader, poultry house cleaner, operating portable farm motors in tandem, electric tractor, barn ventilator, stock water heaters.

Oklahoma Gas & Electric Co.—grinding of snapped corn, underheat poultry brooder, effect of power interruptions on incubator hatching of eggs.

Chester Valley Electric Co.—milk cooling, molasses feed heater.

Southern California Edison Co.—soil heating, production of parasites.

Alabama Power Co.—lamps for insect control, dairy refrigeration.

Wisconsin Power and Light Co.—milk cooling.

Edison Illuminating Co. of Boston—flowering of plants, poultry brooding, heating of brooder houses.

Edison Light & Power Co.—cold storage of fruits.

New York Power & Light Co.—calf-feed warmer.

Though most of the applications under study in 1931 have been successfully developed, we find that much of today's research is devoted to seeking further improvements in these same operations.

Almost from the start it became apparent, however, from these various test projects and other activities that, if farm electrification was to make rapid progress, engineers must solve the problem of developing lower-cost farm lines and electrical farm equipment. To A. E. Silver, then an engineer with the Electric Bond and Share Co., and his associates, goes the credit for pioneering the low-cost farm-line extension. In 1932 these men initiated the work which culminated in the design of a simplified farm-type transformer. They also designed a system of distribution combining high-voltage operation with long-span and common-neutral construction. These developments received nationwide adoption, and essentially they constitute the

standard pattern for all farm distribution in use today. In recognition of this achievement, Mr. Silver was awarded the 1951 Lamme Medal by the American Institute of Electrical Engineers.

To Idaho Power Co. goes the credit for pioneering the area basis of farm-service extension. Large contiguous areas of its territory were surveyed and planned as units for complete electrification. In 1935 this company received the Charles A. Coffin medal awarded by the Edison Electric Institute on behalf of the General Electric Co. for outstanding achievement in electrifying the farms in its territory.

Records show that the CREA program was carried forward ably and energetically. The National Electric Light Association, Edison Electric Institute, and individual light and power companies supplied funds generously; state universities and agricultural schools contributed the services of their experts and use of laboratory facilities; manufacturers loaned equipment for experiments and tests; and the various farm organizations and the Department of Agriculture extended full cooperation. However, in 1935 the American Farm Bureau Federation, the National Grange, and the Departments of Agriculture, Commerce, and Interior of the Federal government withdrew from membership, and the CREA went out of existence shortly thereafter.

Recent Research Activities

The electric companies, however, actively continued their interest in research, and characteristic of what they have been doing in recent years is a study that began in 1944 on a 262-acre Ohio farm. This particular study has shown that on an average farm in six years' time electricity can materially increase the money earned per hour of productive labor. This research has been carried on by the Westinghouse Electric Corp. and the Doane Agricultural Service in cooperation first with The Ohio Public Service Co. and later with its successor, Ohio Edison Co., under conditions identical to those faced by the average farmer. The original farm comprised 140 acres and, when selected for test purposes, was not electrified. A dairy farm, it required, prior to electrification, 6,800 hr of labor annually by the farmer and his son. Since then 122 acres have been added. Yet, in 1950 only 4,532 hr of labor were required for the entire 262 acres. More than 50 per cent of the total labor saved was in dairy operations, even though the number of cows was increased from 11 to 16. All of the equipment that made this reduction of labor possible was purchased by the owner at retail prices, solely from the profits on the farm's operations. Simultaneously with electrification a program of soil conservation was begun.

One by one electrically driven devices were introduced on this farm: such as a farm water system, tool grinder, seed cleaner, electric fence, hay baler, grain elevator, completely equipped electric milking parlor, electric water heater, feed grinder and mixer, and space heating in milk house and parlor. During the first full year that electricity was available, 1945, the farm used 1,496 kwhr. In 1949, the use was 5,612 kwhr and in 1951 it was 13,700 kwhr.

Another interesting farm study was that carried out in 1949-1950 by the Central Illinois Light Co. in DeKalb County, Ill., in cooperation with the University of Illinois. The prime purpose was to study the characteristics of the present and potential farm electric load as a guide to future planning by the company's engineering and sales organizations. Illinois farmers as a group enjoy a high income, but the average for DeKalb farmers is twice that for the state. The average DeKalb farm is 167 acres. In DeKalb County 1,450 farm customers of the Central Illinois Light Co. used an average of 7,000 kwhr in 1949 and 8,000 kwhr in 1950—about double the state and national averages. Of these farms, 97 were selected at random for study.

These two important conclusions were readily apparent from the survey: (1) the greatest use of electricity today is in the farm home; (2) the farm chore load offers the greatest potential for future electric business. Saturations of refrigerators, electric ranges, and water heaters were found to be 100, 73, and 63 per cent, respectively. Farm chore equipment, with the exception of milking machines and water systems, showed less than 50 per cent saturation. The survey indicated that the use of hay dryers, barn conveyors, feed grinders, and similar equipment would boost average annual farm consumption of electricity to 12,000 kwhr.

The study revealed further that dairy farms were the highest users of electricity with an average of 12,250 kwhr a year, the highest being 30,000 kwhr; livestock farms were second, averaging 9,100 kwhr, with the highest 30,000 kwhr; mixed farms averaged 3,895 kwhr, with the highest 14,800 kwhr. These maximum figures applied to the largest farms, some of which embrace 400 acres.

The entire DeKalb area was being served with single-phase distribution. No farms used three-phase motors. The company's regulations permit motors up to 7.5-hp rating. In view of the large size of some of the farms, most feed grinding had been done by mills of 10- or 15-hp size belted to tractors. Research at the university proved that this type of grinding could be done on automatic electric grinders operating over longer periods of time and with motors no larger than 5 hp.

Another thing learned was that even on the best farms the lighting was substandard. Whether this belongs in the realm of research or education, it is another job where the electric company should take the leadership. As a result of its numerous findings, extension of the DeKalb research project to other utility areas might prove profitable to the companies.

Another extensive study in which the electric companies have considerable interest is the Wisconsin Electric Research Farm project. Started in 1946 by the University of Wisconsin with funds supplied by the Wisconsin Utilities Association, its object is to find better ways of applying electric service to the dairy farm as distinguished from the farm home. Specifically, researchers desired to ascertain whether changes in farm equipment or changes in farm building design and arrangement could produce greater profit for the farmer through better farm electrification.

Some of the findings, as reported by Professor F. W. Duffee, Chairman of the Department of Agricultural Engineering, University of Wisconsin, in a talk at the Edison Electric Institute convention in Denver in June, 1951, are as follows:

> On some farms as much as 65 per cent to 70 per cent of the labor is used for livestock chores. . . . The silo unloader reduced the time of getting down silage for this 24-cow herd from about 10 min to about 10 sec, as compared to climbing the silo and throwing down the silage with a fork. Feeding silage to cows with a new type dispensing cart . . . reduced the time from about 14 min to

about 10 min. . . . Cleaning with a barn cleaner, as compared to driving through the barn with the manure spreader, reduced the time from 22 min to a little over 5 min. . . . Cow trainers, which are electrically operated devices to train cows to keep their stalls clean, work well in stalls of conventional length, but when used in extra long stalls they practically eliminate the necessity of cleaning cows at all, except, of course, for washing the udders at milking time. . . . Water is piped under pressure to the cows, hogs and chickens to eliminate all carrying of water by hand. . . . Heat lamps used for brooding pigs will save an average of one pig per litter in cold weather. . . . The feed plant saves a substantial amount of cash outlay for feed grinding and mixing, as well as the handling and in many cases the time and expense involved in hauling the feed to the custom mill.

The farm home of this Wisconsin project was completely electrified as part of the study. The total connected load of the farmstead is 96.6 kw divided: farm home 44.6 kw, farm buildings 52 kw. This test farm used 30,900 kwhr in 1948; 43,000 in 1949; 44,800 in 1950. By contrast, the average Wisconsin farm used 4,000 kwhr in 1950.

These projects serve to point up that not only in Illinois and Wisconsin but throughout the country the surface has hardly been scratched so far as the use of electricity on the average farm is concerned, for, may I repeat, most of it is being used in the farm home. On the other hand, the tractor people have done a remarkable job in relieving the farmer of much of the work in the field. Professor Duffee substantiated this situation when he said:

> When I was on an Indiana farm 40 years ago, it was considered a fair day's work to plow two acres. Today many, many farmers have equipment with which they can plow two acres per hour, and some exceed this. I cultivated six acres of corn a day in 1908; today many farmers cultivate 60 acres a day. . . . These illustrations are examples of what has happened to field work, or crop production, on American farms. I suppose, as an average, one man now does about what three men did 40 years ago. There is now nearly one tractor for every farm in the United States. . . .

The electric companies recognize that they can prosper only to the extent that the areas in which they do business enjoy healthy and durable growth. All of their money, invested in generating equipment, substations, and lines, is anchored in the soil of the territories they serve. Unlike manufacturers and other industries, an electric company cannot move to another section if it finds business slack and unsatisfactory. All utility companies are, therefore, active in area development. This extends not only to the securing of new industries in cooperation with local chambers of commerce or in helping existing industries expand but also to land improvement and cultivation. Arkansas' Balanced Farming Contest and Georgia's Winter Grazing and Year-Round Grazing Contests are excellent examples relating specifically to agriculture.

Utility Area Development Programs

The "Helping To Build a Finer Carolina" program of the Carolina Power & Light Co. is an example of a program that, while embracing practically every phase of territorial development, includes an activity for farmer participation.

For many years Arkansas was considered a one-crop state. Agriculture is now shifting from cotton production to a grassland system of agriculture with livestock. In 1947 there was inaugurated under the joint sponsorship of the Arkansas Power & Light Co., Arkansas Press Association, Farmers Home Administration, and Agricultural Extension Service what is known as the Arkansas Balanced Farming Contest. It stresses the importance of soil conservation, raising of quality livestock, proper livestock feeding, and cultural and fertilization practices to obtain highest yields per acre. The program has averaged 10,000 entrants per year. As late as 1940 there were but eight crops in Arkansas that returned farmers as much as $1,000,000 in cash. In 1950 Arkansas had 18 farm crops, each with a cash value of more than $1,000,000. Agricultural income for the state increased from $164,000,000 in 1940 to $569,000,000 in 1951, according to the U. S. Department of Agriculture.

Georgia Power Co., which in many ways has done much to improve rural life in Georgia over a period of years, has awarded annual prizes for the planting of better pasture lands since 1948. Two contests are held—a Future Farmers of America Winter Grazing Contest and a Veteran Farm Trainees Year-Round Grazing Contest. This year, 1,923 future farmers competed, planting 7,826 acres of winter pasture. A total of 2,514 veteran farm trainees planted 52,525 acres of year-round pastures.

Georgia Power Co. also financed research on two varieties of hybrid corn during the period 1944 to 1948. In 1951, of Georgia's farmers who planted these hybrid varieties, 44 per cent produced a yield of 100 bushels per acre. This might not sound startling to a Midwest farmer, but it is quite an advantage to a Georgia farmer where the average corn yield has been 16.5 bushels per acre.

Down in Texas, spinach farmers of the Rio Grande Valley, in an area producing winter garden vegetables, are faced with serious losses due to white rust and other diseases. The Central Power and Light Co. of Corpus Christi has made available a refrigerated laboratory to experts of Texas Agricultural and Mechanical College and the U. S. Department of Agriculture so that research in disease-resistant spinach varieties can be speeded up.

This company has also been cooperating with the State College and the Agricultural Experiment Station in research on grasses and legumes. Approximately 150 varieties of grasses and legumes are being screened to determine adaptability, production, nutritive value, fertilization, and water requirements.

In the state of Washington, the Pacific Power and Light Co., in cooperation with Washington State College, found that forced air dried pea vines—normally a waste product—made hay with a feeding value equivalent to the best quality alfalfa hay.

Another example of utility interest worth citing is in the area served by the Appalachian Electric Power Co. In 1948 farmers in Virginia and West Virginia lost much of their net profit from a $70,000,000 tobacco crop, the loss occurring between the cutting, grading, and curing of the tobacco and its sale. In cooperation with farmers, extension service workers, and others, a long-range four-point program to reduce the loss was launched that same year. Grading practices were attacked as the initial step in the pro-

gram, because most immediate results were looked for there. The results indicated that the farmers' net income could be increased 10 per cent by improvement in this one step alone. Started in 1949 was Step II: better, hardy, disease-free plants; Step III: supplemental irrigation; and Step IV: better curing practice. It is estimated that at the culmination of this long-range program, net income to the farmers from tobacco alone may be increased by $18,000,000.

Beginning in 1951, all of the electric companies in Ohio and 18 of the state's 28 rural electric cooperatives established the Ohio Farm Electrification Council and subscribed 10 cents a farm meter for each of three years into a fund to be administered by Ohio State University. Research studies and clinics have been held to secure information and useful data on (1) infrared brooding, (2) dairy and poultry building ventilation, (3) the effect of processing feed on animal nutrition and metabolism, and (4) harvesting of wheat at different stages of maturity in an effort to improve milling quality. Ohio farmers have been losing hundreds of thousands of dollars annually in poor quality wheat due to storing harvested wheat with too high a moisture content. Proper forced air ventilation is expected to reduce such losses. Independent research in this particular field has also been carried on by individual power companies.

Jackson's Mill, located near Weston, W. Va., and recognized as the pioneer state 4-H camp in the United States, had its beginning in 1921 when the Monongahela West Penn Public Service Co. donated five acres of land for the purpose. Today the camp covers 523 acres and is a meeting place throughout the entire year for agricultural organizations, youth activities, and educational groups from all over the state. In the summer its overnight capacity for 350 lodgers is overtaxed. Among its many structures is the Farm Electrification Building, a well-equipped laboratory where better farm living methods are demonstrated to young and old. The building was erected by the utility companies of West Virginia and dedicated in 1940.

It was an employee of Monongahela Power Co., loaned for the purpose and working with agricultural agencies, who was instrumental in getting an artificial insemination program started in the Clarksburg, W. Va., area about 1946. This activity has meant much to the state's dairy farmers. The company advanced the funds needed to insure operation of the project for one year. The program has spread to 37 counties, and over 100,000 cows have been so bred. The average annual dollar return after feed cost from the average West Virginia dairy cow in the period, 1939-1948, had been $78, whereas a study by the State University extension staff shows that for some 600 daughters of cows artificially inseminated the annual return after feed cost has averaged $265, or nearly four times as much.

Edison Electric Institute's Farm Section made a compilation in 1951 of special studies and research contributed to or conducted by electric companies for the four-year period, 1947-1950. The information was secured by checking with land-grant colleges, universities, and the companies. This report listed 88 separate and distinct projects, embracing 244 different activities. More than 60 electric companies in 29 states were shown to be active in investigations, either independently or in conjunction with the educational institutions.

A new report by the Institute will be off the press shortly. This report will list the interest of 50 electric companies in 434 separate activities, giving the name of the project and cooperating agencies.

So much for what has been done and is being done by electric companies in research. Now what of the future? Agriculture is the largest business in the United States. It is estimated that one-sixth of our population lives on farms and receives from 7 to 8 per cent of the national income.

Successful farming today is strictly a business. The farmer is a business man with a considerable investment. It is not uncommon for the investment in an Ohio farm to run $100,000 or more.

Not only does the farmer have a sizable investment in livestock, land, and equipment but he also must meet a high annual operating expense. Today's successful farmer spends sizable amounts for fertilizer, insecticides, hybrid seeds, farm equipment maintenance, operation, and labor. Gone are the days when he was relatively self-sufficient with a relatively small investment in wagons, buggies, and horse-drawn farm machinery.

Today's farmer is not likely to be interested in makeshift electrical appliances and equipment which require considerable engineering, improvisation, and service to keep them operating, with the attendant danger that they might fail when they are needed most with resulting delays and loss of valuable farm products. The farmer is used to modern household appliances, a modern automobile, tractor, farm machinery, and equipment which generally give many hours of trouble-free service.

Possibly one answer to the problem of why farmers do not purchase more electrically operated productive farm equipment is that such equipment must normally be installed in existing farm structures—structures requiring considerable alterations to make them suitable for such installations as a hay or crop dryer or for a modern dairy barn or poultry house complete with electrical equipment. A number of manufacturers of crop drying equipment have recognized this problem and now are selling buildings designed for crop drying.

It is encouraging to note the extent to which farmers have accepted many new farming practices in recent years. Much credit must be given to our farm organizations, agricultural extension service and experiment stations, U. S. Department of Agriculture, vocational agricultural schools, farm youth organizations, agricultural magazines, and forward-looking equipment manufacturers for their part in these achievements. I believe that the farm youth of our country should be given credit for a part in our parade of progress. The imaginative youth is quick to grasp new ideas and urge their adoption.

The electric companies in particular have an extensive and deep-rooted interest in profitable farming. The future of a considerable portion of their business is committed to and bound up in the future of farm electrification. They can be counted upon, therefore, to continue their long-time interest in agricultural development.

Further, with such a large segment of the population engaged in farming, the electric companies deem it a challenge to continue their best efforts to make electricity do more and earn more for the farmer and his family. To that end, the companies also urge and pledge cooperation in a program of continued coordinated research on the part of all farm agencies and organizations.

Proposed Amendment to the Atomic Energy Act of 1946

Accompanying Memorandum

The following memorandum and proposed amendment to the Atomic Energy Act of 1946 were recently submitted to the Joint Committee on Atomic Energy of the U. S. Congress in response to a request of August 20, 1953, from the joint committee to the EEI Committee on Atomic Power, asking for specific legislative recommendations and changes in the act.

THE proposed amendment which this memorandum accompanies represents a practical approach to problems under the Atomic Energy Act of 1946 as they affect the electric power industry. The Edison Electric Institute presents this proposed amendment at the invitation of the Joint Committee on Atomic Energy of the U. S. Congress. The membership of the Institute represents a large segment of the electric power industry and, through that industry, investors who number in hundreds of thousands directly and in millions indirectly.

The common denominator of all the problems dealt with by our proposed amendment is that they affect or may affect the power industry in its ability to continue to serve the public. Thus, regardless of how much appeal other problems may have, all problems not having to do directly with the electric power industry have been put to one side for purposes of the proposed amendment and this memorandum.

The Institute recognizes that the atom presents, and will continue to present, a shifting picture to our society and our economy. Neither the existing Atomic Energy Act nor any amendment or revision of it represents or will represent a final solution of atomic problems for a very long period. Consequently, no attempt has been made to remake the atomic world for all time to come. Instead, the Institute has felt that its proposed amendment should meet the pragmatic tests: will it preserve the safeguards regarding things atomic which are necessary for the common defense and security? And will it work better than the present act with respect to the electric power industry and the public which it serves? It is believed that our amendment meets these tests and promises to do so for a reasonably foreseeable period of time. Consequently, we recommend that the amendment be enacted, even though it is recognized now—as it was in 1946—that the act may have to be revised from time to time.

The Institute does not imply that other questions, some of profound significance, should not be dealt with by the joint committee. Members of the Institute would be in sympathy with a revision of the act ending the government monopoly of atomic developments, eliminating secrecy beyond that necessary for military security, bringing the patent provisions of the act into line with the traditional American patent system, and in other respects revamping the act to make it fit more nearly into the American pattern of free enterprise. All these problems will undoubtedly be the subject of studies presented to the joint committee by bar associations and organizations who speak for other interests.

Indirectly, of course, the electric power industry has an interest in some of the problems which are not dealt with by the proposed amendment. The patent question is an example. Patents have played almost no direct part in the electric power industry for many decades. Furthermore, it is believed that patents will play a small part, if any, within the electric power industry itself in the atomic age, since the industry is one in which profits are limited and the patent incentive would necessarily be relatively unimportant. Nevertheless, it is our vital concern that the manufacturers of equipment and apparatus essential to the operation of the electric power industry shall have the incentives which a good patent system, well administered, will provide to spur forward new developments and improvements to serve our needs and, through us, the needs of the public. However, we have confined our amendment to matters primarily and directly affecting our industry and have left patents and other matters to those who can speak with a more immediate authority.

Having selected in the manner stated the material with which it should concern itself, the Institute then determined that this material should be dealt with on the broadest possible basis, taking into account the consuming public, the national welfare, and the investor-owners of the industry who directly and indirectly include most of the heads of families in the nation, as well as the power industry itself. It is recognized that atomic developments are of too great moment to admit of any narrower approach.

Moreover, the Institute believes that there is a basic philosophy which should guide the revision of the Atomic Energy Act, whether generally or with respect to specific problems such as those confronting the electric power industry. The policy considerations justifying the original complete governmental monopoly no longer exist. In the future, if the superior position of the United States with respect to atomic energy is to be maintained, it must be maintained in terms of industrial capacity and industrial development. In this respect, the present act operates in reverse: complete government monopoly tends to inhibit industrial participation, the very level upon which our superiority has been demonstrated in other fields and can be maintained with respect to the atom.

Practical considerations likewise point to the desirability of a revision of the act. A nuclear power industry would add greatly to the nation's reserve of trained and experienced nuclear energy experts. It would also

increase and disperse atomic facilities which could be utilized for emergency purposes in time of war.

Turning to the mechanics of the proposed amendment, for drafting purposes it was necessary to have a framework into which to fit it. It has been drafted, therefore, as if it were a section of the Atomic Energy Act of 1946 on the assumption—which may prove to be unrealistic—that that act will remain substantially as it is, except for this amendment. If there should be a general revision of the act, it is believed that an amendment substantially like the accompanying one will still be capable of utilization with only mechanical changes. It is the substance of the provisions, of course, in which our industry is interested.

If, on the other hand, there should not be a general revision of the act, it is believed that an amendment like the accompanying one, providing an opportunity for the electric power industry, should nevertheless be adopted; for the electric power industry is the peacetime industry which at present promises most through atomic developments and is also the peacetime industry which has shown the most active interest in pushing forward with the utilization of atomic energy.

The proposed amendment of the Institute rests upon an arch, one column of which is the participation by industry in the production and ownership of atomic materials and equipment for the production of electric power, and the other column of which is the safeguarding of military security, public safety, and public health in handling those materials and equipment. The keystone with which these two columns are locked into balance is the regulatory power of the Atomic Energy Commission. The electric power industry is one which is peculiarly susceptible of effective regulation, even in a supersensitive area, since it is already regulated in almost all that it does.

It is to be noted that the proposed amendment is entirely consistent with relevant portions of the Atomic Energy Commission's statement of policy regarding electric power, as given to the joint committee by Chairman Strauss on July 31, 1953:*

> First, we believe the attainment of economically competitive nuclear power to be a goal of national importance. Reactor technology has progressed to the point where realization of this goal seems achievable in the foreseeable future if the nation continues to support a strong development effort. It would be a major setback to the position of this country to allow its present leadership in the world in nuclear power development to pass out of its hands . . .
>
> Third, in addition, it is the convicton of the commission that progress toward economic nuclear power can be further advanced through participation in the development program by qualified and interested groups outside the commission.
>
> Fourth, we recognize the need for reasonable incentives to encourage wider participation in power reactor development, and propose the following moves to attain this end:
>
> (a) Interim legislation to permit ownership and operation of nuclear power facilities by groups other than the commission.
>
> (b) Interim legislation to permit lease or sale of fissionable material under safeguards adequate to assure national security.
>
> (c) Interim legislation which would permit owners of reactors to use and transfer fissionable and by-product materials not purchased by the commission subject to regulation by the commission in the interest of security and public safety . . .
>
> (f) Consideration of a progressively adjusted code for safety, and exclusionary requirements as may appear reasonable in the light of operational experience with reactors. Competent state authorities will be encouraged to assume increasing responsibility for the safety aspects of reactor operation. Financial responsibility associated with reactor operation will be assigned to the owners in keeping with normal industrial practice.
>
> (g) Giving full recognition to the importance of reactor technology to our national security, a progressively liberalized information policy in the power reactor field as increasing activity justifies.

In view of the pragmatic approach represented by the proposed amendment of the Institute, many of the broad constitutional issues which may confront the joint committee in connection with a complete revision of the act become subordinated for present purposes. It is believed that the proposed amendment fits within the same constitutional confines as the present act.

The constitutional issues, many of which were called to our attention by the chairman of the joint committee through the executive director's letter of August 20, 1953, are, of course, of basic importance in any over-all study. It is the intention of the Institute to continue to study these broad issues as they affect our industry. If it is thought that any such future studies will be of assistance to the joint committee, they will, of course, be made available. For present purposes, we are confident that the joint committee will receive assistance from others, particularly bar associations, to whom the constitutional issues are of professional concern.

The terminology in the accompanying memorandum is taken from the Atomic Energy Act of 1946. Thus, the following terms are all used as defined in the existing act: "source material," "fissionable material," "by-product material," "atomic energy," "equipment or device utilizing fissionable material or atomic energy," and "facilities for the production of fissionable material."

We turn now to the specific subsections of the proposed amendment.

Subsection (a). This subsection applies to the electric power industry the philosophy expressed in Section 1 (a) of the present act. In line with the policy declared in Section 1 (a) of "strengthening free competition in private enterprise," the commission is directed by the amendment to "encourage private industry in the conversion of atomic energy into electric energy or into thermal energy as an incident to the generation of electricity or to other public utility operations." As in Section 1 (a), however, this direction is "subject to the paramount objective of assuring the common defense and security."

Subsection (b). This is the general authorization to the commission to grant and renew licenses under the proposed new section. The licenses are to be granted "as provided in this section," and therefore are subject to the further provisions of the section. The licenses are to be for specified periods of time, which may vary from one situation to another, depending upon the type, size, and characteristics of the enterprise being licensed. The length of term of each license is left to the administrative discretion of the commission.

Subsections (c), (d), (e), and (f). These subsections are designed to permit private ownership in the electric power and utility field of fissionable material, source material, by-product material, facilities for the production of fissionable material, and equipment or devices utilizing fissionable material or atomic energy. These

* Hearings Before the Joint Committee on Atomic Energy, 83rd Congress, First Session, Atomic Power Development and Private Enterprise, pp. 563-564.

subsections are believed to be necessary if any real encouragement is to be given to private industry in the utilization of atomic energy for the production of electric power and energy. Without private ownership and the safeguards which accompany it, even truncated as they must be in this case by subsequent subsections of the amendment, neither private capital nor human effort can be expected to be expended as will be required if the nation is to benefit from the developments which the utilization of atomic energy in the power field will provide. To some extent the necessary safeguards are included in the subsections here dealt with. For example, the commission's authority to issue licenses is permissive; it has the power to select licensees, so that responsibility for safety and security may be taken into account. Also, in connection with any mortgage or pledge, the commission is given control in subsection (f) over the enforcement of the pledge, so that atomic materials can never fall into irresponsible and unauthorized hands. Further safeguards are provided by other subsections of the amendment.

Subsection (g). In this subsection the full administrative authority of the commission is invoked. It is there authorized to include in licenses "such conditions as it deems necessary for effective and enforceable safeguards against the use for destructive purposes of atomic energy or fissionable material and for the military security, public safety, and public health."

Subsection (h). This authorizes application to a court or modification or amendment of licenses by the commission for violations of conditions in the license provisions of the Atomic Energy Act or regulations.

Subsection (i). This subsection gives the commission emergency powers temporarily to stop operations of licensees and to take possession of atomic materials and equipment, with a proviso for damages or compensation in appropriate cases.

Subsection (j). This gives the commission broad regulatory powers, including powers of inspection, for the protection of the common defense, public health, and public safety.

Subsection (k). Subsection (k) authorizes the commission to enter into contracts for the sale and purchase of fissionable material, source material, and by-product material.

Subsection (l). This makes inapplicable to licenses issued under the new section those inconsistent provisions regarding licenses in subsections (a), (b), (c), and (d) of Section 4 and Sections 5 and 7. Subsection (l) also makes applicable to licenses issued under the amendment the provisions of Section 10 (b) (5) (B) (i) of the existing act, which requires investigation by the Civil Service Commission of persons having access to restricted data and clearance by the commission of such persons.

Subsection (m). This gives the commission power to take atomic materials by exercise of the power of eminent domain in times of national emergency and when necessary for the common defense and security. Compensation is to be determined under the applicable sections of the Judicial Code, as is at present provided in Section 13 (a) of the existing act.

Proposed Amendment

(a) Subject to the paramount objective of assuring the common defense and security, the commission is directed to encourage private industry in the conversion of atomic energy into electric energy or into thermal energy as an incident to the generation of electricity or to other public utility operations.

(b) The commission is authorized to grant and renew licenses, as provided in this section, to private, municipal or public corporations, or other organizations created by the laws of the United States or of any state thereof for specified periods of time and for the purpose of permitting the conversion of atomic energy into electric energy or into thermal energy as an incident to the generation of electricity or to other public utility operations.

(c) Such licenses may authorize licensees, within the jurisdiction of the United States, in connection with the production of electric energy or other public utility operations, or the development of processes, techniques, equipment, devices, and facilities for the production of electric energy or for other public utility operations:

(1) to acquire, manufacture, own, and use fissionable material, source material, by-product material, facilities for the production of fissionable material, and equipment or devices utilizing fissionable material or atomic energy; and

(2) to sell, lease, transfer, or otherwise dispose of fissionable material, source material, by-product material, facilities for the production of fissionable material, and equipment or devices utilizing fissionable material or atomic energy to any person, firm, corporation or governmental department or agency authorized under the laws of the United States to possess or acquire such material, facilities, equipment, or devices.

(d) The commission may authorize a licensee under this section to contract with other persons for the manufacture or construction of facilities for the production of fissionable material or of equipment and devices utilizing fissionable material or atomic energy; and the commission may issue licenses for such manufacture and construction to such corporations.

(e) Any person, firm, or corporation having any lawful right, title, or interest in or to any fissionable material, source material, by-product material, facilities for the production of fissionable material, or equipment or devices utilizing fissionable material or atomic energy may transfer such right, title, or interest to any licensee whose license permits the acquisition thereof; and such transfer shall be exempt from the prohibitions of Sections 4, 5, and 7 of this chapter.

(f) The commission may authorize any such licensee to mortgage or pledge any such material, facilities, equipment, or devices; provided, however, that no sale of any such material, facilities, equipment, or devices upon the foreclosure of any such mortgage or the enforcement of any such pledge shall take place except pursuant to order of the commission. In connection with the foreclosure of any such mortgage or the enforcement of any such pledge or in any proceeding

involving the insolvency or bankruptcy of any licensee, if a receiver or trustee shall be appointed, the receiver or trustee shall first be approved by the commission. Until such time as the commission shall determine that there is a sufficient, open market for such material, facilities, equipment, and devices, the commission may provide, in any order authorizing a mortgage or pledge, that in the event that there is a sale pursuant to foreclosure of such mortgage or enforcement of such pledge, the commission will fix an upset price in accordance with the standards applicable in determining just compensation in cases of eminent domain and, in the event there are no bids received at or in excess of such upset price for such materials, facilities, equipment, or devices from persons whom the commission has authorized or shall authorize to purchase the same, the commission will itself purchase such materials, facilities, equipment, or devices at such upset price.

(g) The commission may include in any license issued under this section such conditions as it deems necessary for effective and enforceable safeguards against the use for destructive purposes of atomic energy or fissionable material and for the military security, public safety, and public health.

(h) If, after notice and opportunity for hearing, the commission shall determine that any licensee has violated or has failed to comply with any condition set forth in the license of such licensee, or with the applicable provisions of this chapter, or with any regulation to which such licensee is subject hereunder, the commission may proceed as provided in Section 16 (c) or may modify or amend such license, or both.

(i) Whenever the commission deems such action to be necessary for military security or for the preservation of public safety or public health, it may temporarily order the immediate discontinuance by any licensee of operations under its license or may temporarily take immediate possession of any material, facilities, equipment, or devices which are the subject-matter of a license hereunder; provided, however, that any licensee whose previously lawful operations under a license shall have been interfered with or whose property shall have been taken pursuant to this subsection shall be entitled to damages for such interference or to just compensation for such taking in accordance with the procedure specified in clause (m) of this section.

(j) The commission shall have exclusive jurisdiction to provide by regulation or order:

(1) for complete accountability by licensees for inventories of fissionable material, source material, by-product material, facilities for the production of fissionable material, and equipment or devices utilizing fissionable material or atomic energy;

(2) for reports and inspections necessary to assure the safe and lawful use of fissionable material, source material, by-product material, facilities for the production of fissionable material, and equipment or devices utilizing fissionable material or atomic energy; and

(3) for standards governing the operations and procedures of each licensee under this section, the facilities, equipment, and devices of such licensee under such license, the location of the plant of such licensee, and such other matters as the commission shall find to affect public safety.

Nothing herein is intended to supersede or abrogate the regulation, whether Federal or state, to which any licensee is or may be subject as a public utility company. The commission may make available, to the extent consistent with the common defense and security, such information as may be required by regulatory bodies having jurisdiction in the premises.

(k) For the purpose of assuring an adequate supply of source material and fissionable material for the operations of licensees hereunder and of assuring a market for fissionable material and by-product material produced in connection with such operations, the commission is authorized to enter into a contract or contracts, for a period not exceeding the term of the license of any licensee hereunder, to supply such source material and fissionable material to such licensee and to purchase from such licensee fissionable material and by-product material produced in the operations of such licensee.

(l) The provisions of subsections (a), (b), (c), and (d) of Section 4 and Sections 5 and 7 of this chapter shall not apply to licenses issued under this section or to the issuance thereof by the commission. The provisions of Section 10 (b) (5) (B) (i) shall apply to the issuance of licenses under this section.

(m) In time of national emergency and when necessary for the common defense and security, the commission may, in the exercise of the power of eminent domain, condemn and take over any fissionable material, source material, by-product material, facility for the production of fissionable material, or equipment or device utilizing fissionable material or atomic energy, upon paying therefor just compensation, including compensation for any injury caused by such taking to the remaining property of the licensee. The commission shall determine such compensation. If the compensation so determined is unsatisfactory to the person entitled thereto, such person shall be paid 50 per cent of the amount so determined and shall be entitled to sue the United States in the Court of Claims or in any District Court of the United States in the manner provided by Sections 1346, 1491, 1503, 2401, 2402, and 2501 of Title 28 of the United States Code, to recover such further sum as added to said 50 per cent will make up such amount as will be just compensation.

New Cook's Cook Book

THE New Cook's Cook Book, a 54-page, attractively illustrated, two-color booklet especially prepared for the cooking novice, was recently made available by the Institute and 100,000 copies have already been sold. Developed by the Home Service Committee, the booklet was designed for widespread distribution by electric company home service departments.

The booklet offers a new concept in cook books by including, in addition to over 100 recipes and complete menus, such basic information as definitions of cooking terms and measurements; advice on buying, meats, poultry, and fish; and hints on how to "dress up" the appearance of food and on the selection of proper utensils.

The New Cook's Cook Book is available from the Institute in minimum quantities of 100 at a price of $16.00 per 100 copies to EEI member companies. An additional charge of 10 per cent will be made to nonmembers.

We Should Change the Atomic Energy Act

Walker L. Cisler

President, The Detroit Edison Company

An address before the Second Annual Conference On Atomic Energy In Industry, National Industrial Conference Board, New York, N. Y., October 29, 1953

MY remarks today strictly express my own personal feelings and I make them as an average citizen, deeply concerned with the strength of our country. I believe the time has arrived for a determination of the ways and means to be used to bring the advantages of atomic energy to the people of the United States.

At present two possible lines of action are being considered — first, a retention of the strict government monopoly over atomic energy and, second, the development of atomic energy and utilization methods by private enterprise, together with governmental control over all military aspects. Of these courses, only the second is within the framework of our traditional American economic system, and I believe all efforts should be made to develop atomic energy under that system.

Why have I reached this conclusion? For more than 30 years I have been engaged in various duties in private competitive industry and during nearly half of these years I have had the opportunity and privilege to serve our government in a number of assignments, both military and nonmilitary. I have gained greatly by these experiences, and I have come to know somewhat closely the social, industrial, and political systems of many of the world's countries.

Mastery of Vital Forces

Our form of government and our economic and industrial system have provided us with many privileges and advantages not enjoyed by many other people. I am confident that all of us believe that our institutions not only have provided these many benefits but also that they must be preserved to maintain and improve the American standard of living. Nevertheless, some have asked why is atomic energy important to the improvement of our economic well-being.

Inasmuch as my experience has been largely in the field of electric power, which, because of its tremendous development during the past 75 years, has been one of the greatest factors in raising our standard of living, I have had many occasions to reflect upon the advance of civilization.

The human race has progressed as people have learned to master the vital forces of the universe. During the last two centuries we have learned to use energy to lighten the burden of human labor, to increase its productivity, to improve transportation and communication. The engine has largely replaced the animal, the oar, and the sail. In almost every area of human activity, the use of heat energy has enabled us to achieve our present high place in the progress of the world.

In the early part of this century, a great scientist, Professor Albert Einstein, promulgated an equation to prove the relation between mass and energy, $E = MC^2$, where E represents energy, M represents mass, and C is a constant, suggested as being equivalent to the speed of light. Most of us may remember the derision and skepticism with which the Relativity Theory was received by a large part of the world's population. Fortunately there were those who recognized the significance of Einstein's work, and the scientific efforts to unlock the secrets of nature continued at an increased rate.

Toward the latter part of the 1930's research and scientific investigations in educational institution laboratories, and elsewhere, in several different countries, had advanced to the point where it became clear that the energy locked up in the atom could be added to the other energy sources available to man. This was a newly discovered force of nature, revealed and brought within our reach.

Because of the world situation, it was necessary that the first use of atomic energy be directed toward military purposes, and so, through the years of war, the development of this new field of science was a military undertaking, having for its purpose strictly military objectives.

In the immediate postwar period, the international situation was such that there needed to be a continuation of the military aspects of atomic energy. I have had the opportunity to study some of the accomplishments which have resulted and I am convinced that the materials, manpower, and money which have been put into the development of atomic military weapons are more than fully justified.

Atomic Energy Must Be Competitive

In the minds of those having great interest in the use of energy for industrial and peacetime purposes, however, there has been a continuing deep concern as to how this new source of energy could be put to work in the same way as other sources of energy; how it could be used to supplement those sources of energy which we now have; how we could make new and better uses of this new source of energy which nature in its wisdom has provided.

There is great uncertainty over the economic aspects of the situation. If atomic energy is to be useful to civilization, atomic materials must be developed to be competitive with other fuels. We can afford to use atomic fuels only when power can be produced more economically than with the conventional energy sources. We must achieve this goal before we can justify the use of atomic energy to meet the ever increasing demand for more and more energy as our economy is developed and living standards are raised.

This new industry, whether it be directed toward generation of electric power or the use of heat for other purposes, must be integrated into our present industrial and economic systems to produce the most effective results. The nation will reap the untold benefits now latent in atomic energy more promptly, more adequate-

ly, and more cheaply if advantage is taken of the dynamic initiative of private industry.

Through our free-enterprise system, developments in science and engineering have been by individuals or groups. Management and labor have worked in an unrestricted manner to produce improvements, and people have invested money to bring about new discoveries and to put those discoveries to practical use.

Economic Basis of Heat Energy Use

The efforts expended in advancing the utilization of heat energy during the past 200 years have been justified because each step forward has proved economical. The efforts have been stimulated by private groups, seeking always to do better. Government's responsibility traditionally has been in the creation and maintenance of a community in which individuals had the opportunity to carry on their work.

The development of our present electric power systems is an excellent illustration of this process. Electricity as such had been known for many years prior to Edison's discovery of the first commercially successful incandescent lamp on October 21, 1879. Many people had experimented with arc lights and other means of developing practical utilization methods. Edison's key invention opened the way for practical widespread use, and from that small beginning, three-quarters of a century ago, we have our great electric power industry today—the generation, transmission, distribution, and utilization of nearly one-half of all electricity produced in the world.

By the end of 1953 we will have available to us from the inter-connected systems of the United States approximately 93,000,000 kw of generating capability, and by 1956 that capability will increase to about 124,000,000 kw. Our generation of power in 1953, including the self-generation of industrial systems, is expected to exceed 510,000,000,000 kwhr as compared with about 680,000,000,000 kwhr for all the rest of the world. More than 80 per cent of this has been accomplished by private enterprise. Similar efforts can now be directed to developing atomic energy.

Our present situation in atomic energy development is such that we do not need to devote all of our science and development capabilities to military purposes. The Atomic Energy Commission wisely has undertaken studies and programs directed toward peacetime utilization. But the Atomic Energy Commission has publicly stated that the efforts which it is able to put forth fall far short of those that are needed to produce the greatest desired result.

The problem is not one of building a single reactor or several reactors which might produce power. The problem is the development of a great number of facets, the development of a new component of industry, which must and can only be undertaken by many minds on a broad front. Fifty years ago about five pounds of coal were required to produce one kilowatthour of electricity. Our most modern plants today require less than seven-tenths of one pound of coal to produce that same kilowatthour of electricity. This advance was brought about not in the laboratories of a few organizations but largely through the efforts of individuals in power plants and manufacturing plants spread across the nation. Industry responded because the economics of the situation justified the efforts which were involved.

What do we need to achieve this same broad approach in the development of atomic energy? What does it take? The obvious answer is that we need to provide essential legal authority so that private industry can engage in the study, research, development, ownership, and operation of peacetime atomic activities. We need to make it possible for individuals and private industry to invest their own funds in research, to conduct investigations and experiments, rather than work exclusively as contractors to the government.

Both the cost of this combined effort and the time required to bring benefits of atomic energy to the people, I am certain, will be less than if the government alone has to do the job. The geographic and economic areas served by this new force of energy will be more extensively and intensively developed if private industry is given the signal to proceed.

The competitive-enterprise approach is one of broad vision, spurred on by the normal incentives of men to advance their position as contrasted with the restricted and limiting approach necessarily inherent in a government monopoly. Every argument ever advanced against private monopoly applies equally to government monopolies. In addition, government must necessarily (and indeed properly) move cautiously to assure popular support, and government must move in too restricted a manner to achieve the most positive and effective results in a new and speculative field like atomic energy.

Amend Atomic Energy Act

To bring about conditions under which private competitive industry can be enabled to invest its own funds in development, the Atomic Energy Act should be amended to permit private industry to do the following:

1. To build, own, and operate atomic energy plants.

   No person or group of persons will invest large funds unless there is legislative assurance that the plant may be owned and operated for a very long time. Adequate financing can be obtained only if the law allows the normal incentives and security for private investment. This includes private ownership of plants and equipment.

2. To acquire, own, and dispose of fissionable materials.

   Since fissionable material is basic in atomic energy operations, private financing is as dependent upon private ownership of such material as upon private ownership of production facilities. Subject to limitations of supply, prior military needs, national security, and to regulation in the public interest, there should be a free right to acquire and sell fissionable material among the licensees and the AEC.

3. To acquire, own, and dispose of source materials.

   The assumption of private financing of facilities is completely unrealistic without an assured source of raw materials.

4. To sell and distribute end products and by-products produced in an atomic energy facility.

   Since the sale of by-products is essential to profitable private operation of atomic facilities, licensees must be free to sell them, subject to necessary health and safety regulations and to national security.

5. To obtain licenses from the Atomic Energy Commission subject only to the requirement that operations there-

under be conducted in compliance with conditions set forth in the license in accord with standards to be prescribed by the act.

The investment of adequate capital cannot be expected unless the duration and the conditions under which operations will be allowed to continue are known.

6. To attain normal patent and trade secret protection subject only to full disclosure to the commission for its own use for purposes of protection of national security.

Only under the incentives of competitive enterprise will the greatest advances in the art of producing and utilizing atomic energy and its by-products be realized. Not only will private development be greater but the military program will also benefit. Satisfactory procedures have long been established for control of inventions and discoveries having military significance. The system has protected the military and at the same time rewarded the inventor for his investment and ingenuity. Industry has accepted this pattern in the past. There is nothing in the nature of atomic energy requiring a different treatment except as may be required in the interest of national security.

One of the most important features of our free-enterprise system is the development of new processes and methods. It seems inappropriate to take away this incentive by changing patent rights and requiring full disclosure to all competitors. Of course, full disclosure to the AEC on a confidential basis should be required to protect the public health and safety and to determine which have military significance.

National security was one of the major considerations in determining the provisions of the present Atomic Energy Act, and regrettably its importance has increased rather than decreased. This is a matter of greatest concern to all of us and we cannot afford to relax in our efforts. The needs of our country in this respect must continue to be determined by Congress, the military, and the Atomic Energy Commission. We should recognize, however, that a very large part of the commission's activities have been carried out by private industry under contract with the government. There is no evidence to my knowledge that security requirements cannot be maintained under those circumstances, and I sincerely believe that the present practices can be expanded to permit more widespread participation of private industry. This is a requirement which we must accept. While it is cumbersome, it is by no means an insurmountable deterrent to the participation of private industry.

It has been said that private industry is not ready to assume the responsibility for development and that there is no need to amend the law now. To a large degree, private industry has been so completely excluded from development that it has not had the opportunity to reach conclusions of any kind. At the present time, electric power systems which produce well over one-half of electric power in the United States are engaged in studies to determine feasibility of developing practical nuclear power reactors. Many others have asked how they can participate. To the best of my knowledge, much of the power industry of our country is showing a deep interest. It should be given the opportunity.

I have never heard a tenable reason advanced why private industry should be excluded from developing, building, owning, and operating a reactor for the purpose of generating power under circumstances which will insure national security, public health, and safety. Those who oppose it would render a public service if they could and would tell us why the government and the government alone should do the job.

Some assert fear of a grand "give away" in atomic energy, expressing the desire to "preserve to the taxpayers the enterprise that the government has built with $12,000,000,000 appropriated from the public treasury." But no government facilities would be transferred to private hands. These would be retained for the weapons program. No raw materials or fissionable materials would be transferred except for a reasonable price. Most of the technical knowledge (apart from weapons affairs) is already a part of the public domain. There is no "give away" but only the opportunity for private competitive industry to assume its traditional role of developing new discoveries of science and new resources to advance the economy and industry of America —and the rest of the world.

We are devoting a substantial part of our energy to a debate concerning whether or not we should continue with the practices and principles which have given this country its tremendous strength and its preeminent position among the nations of the world. That, of course, is a part of our democratic process. The time comes, however, when debate should be translated into action and I believe the time now has come when we should amend the Atomic Energy Act and devote those energies toward the attainment of further progress in the economic and peacetime use of atomic energy.

PUAA Meetings

THE officers and directors of the Public Utilities Advertising Association, at a November meeting at Minneapolis, Minn., approved the selection of Chicago, Ill., as the 1955 national convention site; approved a proposal to make the PUAA 1954 national convention in Boston, Mass., May 13-14, 1954, at the Hotel Statler, into a full-scale workshop featuring case problems; and announced the remainder of this year's regional meetings, which have been based on the workshop idea.

These regional meetings began in September, 1953, and will continue into March, 1954. Region 2 is the next to meet, and its members from New York, New Jersey, eastern Pennsylvania, Maryland, Delaware, Toronto, and Bermuda will convene at Skytop, Pa., December 10-11.

The Region 5 meeting, in February, the dates of which are yet to be announced, will be at Atlanta, Ga., and will include members from Virginia, South Carolina, Tennessee, Georgia, Mississippi, Alabama, Louisiana, Florida, and Cuba.

On February 25-26, at the Mount Royal Hotel, Montreal, Que., Region 1 members from New England and Quebec will meet.

Region 9, which encompasses Wyoming, Montana, Arizona, Utah, Idaho, Washington, Oregon, Nevada, California, Vancouver, and Hawaii, will meet in March—date and place to be announced.

The Economic Impact of Atomic Energy on the Electric Power Industry

E. H. Dixon
President, Middle South Utilities, Incorporated
Chairman, EEI Committee on Atomic Power

An address before the Second Annual Conference on Atomic Energy in Industry, National Industrial Conference Board, New York, N. Y., October 30, 1953

IF I were to confine my remarks to my assigned subject—namely, the economic impact of atomic energy on the electric power industry—I believe mine would be the shortest talk in the history of the National Industrial Conference Board. It would take me about three or four sentences. I say this because, in my opinion, present indications are that it will be some years before this new energy source has any material *economic* impact on the electric power industry, in this country at least. Long range, I have no doubt that atomic energy may become a competitive factor in the generation of electric power. If and when it does, its economic impact on our industry, as I see it, will be principally to supplement present fuel sources. To the extent that savings in costs are possible, they no doubt will be of principal benefit to our customers, if history provides a reliable barometer.

Having now fulfilled by assignment but having no desire to set a speed record for speeches, I should like to make some observations.

Objectives and Incentives

The important interest of the electric power industry in the atomic energy program of this country is well known. Tangible evidence of this interest is found in the fact that a substantial majority of the companies participating in the study teams under authorization from the Atomic Energy Commission are electric power companies. Still other companies within the industry recently have been seeking means of participating in the program. There are many reasons for this interest and effort, and I think it is important that they be understood. I should like to separate them into what may be called direct and indirect reasons.

In the first category, a fundamental objective of the electric power industry is, and has been since its inception, to seek lower costs of generating electricity for the continuing benefit of the public. Toward this end, numerous electric companies and equipment manufacturers conduct research programs extending from experimentation with various fuels, and methods of mining or otherwise obtaining such fuels, to technological improvements in the design and construction of boilers, turbine-generators, and auxiliary equipment.

A second direct consideration is that the electric power industry desires to expand the fuel sources available for generation of electric power and to conserve the nation's reserve of fossil fuels. We can't help but be impressed by estimates indicating that the energy in deposits of uranium and thorium are more than 20 times greater than the energy contained in the world's known recoverable reserves of coal, oil, and gas. Thus, the stakes in connection with this new energy source appear to be very large indeed.

The indirect benefits which would result from successful application of atomic energy to the generation of electric power are several. First, it is apparent that great national prestige would obtain if the United States were to become the first nation to utilize nuclear power extensively on a peacetime basis—that is, to produce electric energy from nuclear fuel on a commercial scale. Secondly, the electric power industry possibly can assist in devising more economical means of producing fissionable materials for national defense and also play a major role in creating a commercial market for these products, assuring their continuing production.

Then, too, participation by electric power company personnel in the program serves to add to the nation's reserve of trained and experienced nuclear energy experts. Moreover, the presence of these technicians in scattered development projects lends a further measure of geographic diversification of skilled nuclear specialists throughout the country, a consideration that would be significant in time of national emergency.

Finally, successful development of atomic power generation could provide a means of invaluable technical assistance to our allies and other friendly nations. The President's Materials Policy Commission stressed our dependence upon certain other nations for vital raw materials—including uranium—that add immeasurably to our industrial and military strength. If we could assist other free countries in applying atomic energy to electric power generation, we would be capitalizing on a rare opportunity to provide economic strength to those nations in return for what they are contributing to our own strength.

This point was emphasized in a recent address by Thomas Murray, member of the Atomic Energy Commission, when he said, "I believe that unless we embark on an all-out attack on our nuclear power program immediately we may be deprived of foreign uranium ores, with the result that our weapons potential will be smaller than need be the case."

Direct and Indirect Motives Important

The real importance of considering both the direct and the indirect motives which have led to the active participation of electric power companies in the atomic energy development program lies in the apparent timing of potential results. Fortunately, our country is well supplied with reserves of fossil fuels and efficient, expanding electric systems, a combination which should assure us an ample supply of low-cost electric power for many years to come. On the other hand, the situation as to availability of electric

power—both from a standpoint of fuel supply and cost—is less favorable in many foreign countries. Thus, even at this early stage of the nuclear power development program, in which the costs of generating electricity may be substantially above those to which we are accustomed, this energy source might be of real benefit to other parts of the world, if it were available. Power reactor installations, wherever located, could provide an opportunity for gaining valuable knowledge and experience for the benefit of the electric power industry and its customers.

These indirect motives and potential benefits provide a real incentive to the electric power industry, and others, for investing both dollars and manpower in a development program that, at present at least, does not appear to offer any near-term benefits to our own economy. In other words, the nuclear power development program can be looked upon as more of an opportunity than a necessity over the shorter-term, while from a long-range point of view it is expected that both direct and indirect benefits may result.

The economics of the generation of electric power from nuclear energy are not at all clearly defined as yet. Reactor experiments to date have not contributed appreciably to an understanding of the dollars and cents of nuclear power production costs. The Atomic Energy Commission has constructed two experimental reactors from which heat energy has been converted into electric power through the medium of conventional turbine-generators. One is the Experimental Breeder Reactor at Arco, Ida., and the other is the Homogenous Reactor Experiment at Oak Ridge, Tenn. Since production of electric power was not the prime goal of either of these experiments, and because they were conducted on only a small scale, no pertinent information as to the cost of nuclear power can be had from their operation. A third reactor capable of producing electric energy, the Submarine Thermal Reactor, likewise, offers little help in assessing the potential of nuclear power for commercial use, in view of the rigid specifications required for this sea-going unit.

This point, too, was covered by Mr. Murray in announcing that the commission has embarked on a program to construct a full-scale power reactor. As he expressed it, "We recognize that costs of power, derived from this first reactor, will be higher than costs from modern plants. But we will really never know the answer to costs until we build and, still more important, until we operate several large-scale reactors."

Another major problem in ascertaining the feasibility of commercial power production relates to the disposal of plutonium, which various reactor types now under consideration would produce in addition to power. While, initially, excess plutonium might be purchased by the government for military purposes, an artificial market of this kind obviously cannot be depended upon throughout the expected life of a generating plant. Eventually, the nuclear power installation must stand or fall on the basis of the electric energy produced, coupled with whatever revenues may be derived from sale of plutonium as a fuel or for other commercial uses. Other by-products, including the fission products or ashes of the chain reaction, likewise may be found to have value, although at present these materials present an expensive disposal problem.

Atomic Fuel Costs Favorable

Recent attempts to estimate the economic status of nuclear power have indicated that the cost of atomic fuel with some types of reactors can be brought below the national average cost today of the conventional fuels required to make a killowatthour of electric energy. Some 40 per cent of the average cost of generating electricity in this country is for fuel, and another 40 per cent, or thereabouts, represents the fixed cost of carrying the capital invested in plant facilities. Thus, the saving which might be derived from substitution of nuclear fuel could be applied to service a part of the added cost of a nuclear reactor and heat exchanger over that of a conventional boiler installation. This approach, then, can be used to determine how many dollars per kilowatt of capacity we can spend to install a nuclear power plant that will turn out kilowatthours at a unit cost comparable to that of a conventional plant of the same size.

Most estimates of reactor installation costs, per kilowatt of capacity, are considerably higher than the upper limits of figures derived in this manner. It is primarily because of this relationship that nuclear power is not considered competitive today.

It should be emphasized that attempts to ascertain the economics of nuclear power generation along these lines can yield only rough approximations. There are a good many variables in the picture, such as technical problems affecting the cost of such a plant per kilowatt, computing the probable thermal efficiency of the reactor, devising a means of reprocessing the spent fuel, determination of a realistic price for initial uranium fuel elements, assigning a value to plutonium and other by-products, and so on. These and other imponderables, however, can be looked upon as potential areas for improvement. They cause us to be hopeful that one day nuclear power may be able to stand on its own feet, although substantial development work appears necessary if this goal is to be attained.

In comparing estimated cost of electric energy derived from nuclear power with those of power generated from conventional fuels, there are two essential considerations which should be kept in mind. First, there is a wide variation in fuel costs throughout the United States, ranging from around 10 cents per million Btu of heat content in some areas to 35 or 40 cents in other areas. For this reason it is logical that cost comparisons, in the initial stages at least, should be made with respect to the sections of the country having highest fuel costs.

Secondly, most comparisons of potential costs of generating electricity from nuclear fuel with those prevailing in plants using fossil fuels are made on the basis of present costs for the latter and expected future costs for the former. This approach overlooks a fundamental characteristic of the electric power industry—that of constantly seeking and developing improvement in installation costs, in efficiency, and in operating costs. Since it was founded 75 years ago, the electric power industry has been successful in reducing continually the cost of generating electricity and making such lower costs available to the consuming public. There is ample evidence that this long-term trend is continuing. Hence, the economics of generating electricity by conventional means should by no means be treated as something static when it comes to making comparisons with estimated

costs of power from nuclear or other sources.

In recent years there has been some indication that the curve of progress in power plant design is flattening out and that new avenues of approach are needed to assure further progress beyond present design limits with respect to temperatures and pressures. Industry has responded to this situation in the typical American fashion. In this instance the problem was attacked jointly by a leading boiler manufacturer, an electrical equipment manufacturer, and an electric power company.

This three-way team is now developing a steam-electric generating plant which will operate at a pressure well above the critical pressure of steam, and at initial and reheat temperatures that likewise represent new high levels. Also, the plant will use "double reheat," a process wherein the steam is returned to the boiler twice and reheated for use a second and a third time, something that has never been attempted in a commercial installation. The expected result is a reduction of roughly 10 per cent in the amount of coal required to make a kilowatthour of electricity at the most efficient plants operating today. Still further improvement will be sought if this installation measures up to expectations.

I mention these technical details to illustrate the dynamic character of the electric power industry and to demonstrate its readiness to accept and bring forward every new development that can advance its technical and economic well-being for the continuing benefit of the public. In budgeting time, effort, and money for improving the prospects of supplying electric energy in the most economical way, it seems logical that we should not only make a full investigation of the interesting potentials of atomic energy but also continue to seek progress along more conventional lines where more immediate returns appear possible. I would expect that the electric power industry will pursue a program whereunder the development of nuclear power is balanced and integrated with work aimed at improving our shorter-term objectives of lower-cost energy from conventional fuel sources.

The time when nuclear power plants can begin to assume a substantial fraction of our annual requirements for expansion of energy production will depend upon a number of factors. The most important of these, no doubt, relates to economic incentives. As stated earlier, there is no apparent prospect that a nuclear plant could compete with conventional power plants on a cost basis in this country over the near-term. However, the prospective indirect benefits and the potential longer-term direct benefits that might accrue from successful development of this power source appear to be of sufficient magnitude to warrant a continuing development program on the part of both government and business.

The other factors affecting the timing of the impact of atomic energy upon the electric power industry center around technical and legal considerations. Without going into either of these factors in much detail, I would like to mention briefly my thoughts as to each.

Other Generation Methods Sought

When central station electric energy was first generated about 75 years ago,* roughly 35 lb of coal were required to produce 1 kwhr of electricity. Today, less than 1 lb of coal produces the same amount of electric energy. Tomorrow, even less coal will be needed. While estimated production costs of power from nuclear sources already appear to be below those incurred in the generation of power 75 years ago, technical difficulties involved in developing reactor-type facilities appear to be greater than has been the case with conventional fuels.

One illustration of the technical problems which our industry has encountered in its efforts to reduce cost of generating power may be taken from our experience with power plants using mercury as the medium of heat exchange. Development of this process was begun about 30 years ago. In 1928 the initial installation of a mercury power plant was made in Hartford, Conn. In the years that followed, several other installations of this equipment were made by electric companies. Two years ago, in a paper presented to the American Society of Mechanical Engineers, an engineer associated with the mercury development program made some interesting observations regarding the then current status of the program. He stated that during the design and preliminary operation of three relatively new mercury plants, a number of important problems were encountered and that these opened entirely new fields for engineering study and operating procedure. It is noteworthy that the difficulties to which reference was made were not encountered until some 20 years after the initial mercury installation had been placed in service and 20 years after the manufacturer had made public announcement of "commercial availability" of the mercury steam system.

Many will recall other avenues of power generation investigated by the electric power industry, whether by pilot plant construction, by small-scale experiments, or simply on paper. These activities include wind power, carbonization of solid fuels for valuable by-products, collection of solar radiation, and even tidal power. Although none of these has materialized on a commercial scale in this country, owing to economic as well as technical considerations, renewed attention is being given to some of them, particularly abroad.

These comparisons of the industry's success in improving the efficiency of conventional steam-electric stations over a great many years, and its experience in developing alternate types of power plants, lead me to believe that a long period of technical development may be required to achieve a competitive nuclear power process. This is particularly true when it is considered that this energy source must obtain a foothold in the face of competition from an established, efficient, and ever-improving operation.

Revision of Atomic Energy Act

Turning to the legal aspects of development of nuclear power by electric companies and other businesses, I would like to summarize general views regarding the Atomic Energy Act of 1946 as expressed to me by a number of electric company executives. This group, in essence, desires changes in the McMahon Act which would permit private enterprise to make such further progress in this development program as appears possible over the near term; it does not now advocate that the doors be opened so wide as to accommodate all things to come as the program moves ahead. Specifically, numerous leaders of our industry favor revision of the act with a view

* For arc lighting.

toward providing an arrangement for licensing electric power companies and others to proceed with the development of electric power generation from atomic energy and toward devising arrangements for the ownership and disposal of fissionable materials, and facilities for the production of fissionable materials, by electric power companies and others. Pending such changes, the recent invitation by the Atomic Energy Commission to private industry to participate with it in the construction and operation of a new atomic energy power plant would seem to be a step in the right direction.

Many electric company executives also believe that certain changes in the patent provisions of the act are desirable in order that consumers of electric power may obtain the benefits resulting from accelerated research and development of new atomic materials and equipment. Since proper patent protection and incentive normally encourage such progress, the electric power industry has a vital interest in appropriate legislation to this end. But, because the electric industry has little direct interest in patents and relatively little experience with patent legislation, I would look for other industries to take the lead with respect to specific recommendations as to the patent provisions of the act.

I believe that my observations may be summarized under three major points.

First, there appear to be many benefits that this country can derive from development of a practical nuclear power technology. Whether these benefits are direct or indirect, long-term or short-term, they should provide sufficient incentive to encourage electric companies and others to continue their sincere efforts toward perfecting processes by which electricity may be produced economically from nuclear reactors. Over the near-term, or until progress is made in improving the economics of atomic power, I would expect that the research and developmental undertakings of the electric industry in this program will be balanced with its efforts aimed at further reduction in generating costs at conventional plants.

Secondly, the technical and economic problems involved in the transition of nuclear power development from the present embryonic stage to wide-scale commercial applications are of great magnitude. Therefore, an extended period of development work appears necessary in order that nuclear power may become competitive, particularly when it is considered that our industry and the equipment manufacturers are continually improving the technology of generating electricity from fossil fuels.

Finally, there is every indication that the work of the Atomic Energy Commission, the several study teams, and others, sooner or later, will bring us to a position from which the prospect will open up for full-scale private development of commercial nuclear power. With this goal in mind, the electric industry should be willing to spend its own money in harnessing this new energy source on a commercial basis. To that end, Federal legislative and administrative policy should be reshaped in such fashion as to make possible and to encourage this eventuality.

I have great faith that the United States will win the atomic power race and complete confidence that the electric power industry will make an important contribution toward this victory.

EEI Publications

EEI Pocketbook of Electric Industry Statistics

Pub. No. 53-12. 1953 Edition. Price: 35 cents per copy. Quantity prices upon request.

Compiled with an eye toward quick comprehension, this year's enlarged edition presents detailed statistics of nationwide scope from authoritative sources, such as FPC reports, government documents, and EEI publications and studies. With expanded sections, the 1953 edition of the pocketbook has also been modified for better presentation of previously included material.

Turbine Operating and Outage Data for 1951

EEI Pub. No. 53-10. A report by the Turbines and Condensers Subcommittee of the EEI Prime Movers Committee. Price: 40 cents to members and their employees; $1.00 to nonmembers in U. S. A.; and $1.10 to foreign countries.

This is a tabulated report of the 1951 operations of turbines operating at 800 psi and higher, including analyses of turbine and condenser outage hours along with the average performances of turbine units during the past nine years.

Power Sales and the Power Salesman

EEI Power Sales Manual, Chapter 1 (Formerly Section I), reprinted and copyright 1953. 20 pages. Prepared by the Power and Heating Sales Committee of the EEI Commercial Division. Price: 50 cents per copy. Quantity prices upon request.

A reference work covering fundamentals of the power salesman's job, this chapter of the Power Sales Manual was prepared from ideas gathered from many companies. It presents information concerning manufacturers, dealers, sales tools, markets, customers, and other things of pertinent interest to the power salesman in a field in which ideas and methods are forever being renewed.

Production Method Analysis for the Power Salesman

EEI Power Sales Manual, Chapter 3 (Formerly Section XII), reprinted and copyright 1953. 32 pages. Prepared by the Industrial Power and Heating Committee of the EEI Commercial Division. Price: 75 cents per copy. Quantity prices upon request.

This chapter of the Power Sales Manual was prepared to help the power salesman review and analyze industrial production methods and to guide him in assisting his customers to develop better production methods and processes. Including charts, tables, and appendices, the chapter discusses use of process charts, analyzing customer operation, practical application of production method analysis, measurement of results, and economics of process changes.

Area Development Suggestions (Industrial Development Financing)

EEI Pub. No. 53-6. 8 pages. Price: 30 cents per copy to members and their employees and 75 cents to nonmembers.

This study attempts to delineate the extent of industrial development financing through foundations, corporations, municipal and state organizations and to illustrate the relative effectiveness of these programs.

Atomic Power in Ohio

Philip Sporn

President, American Gas and Electric Company

An address before the 60th Annual Meeting of the Ohio Chamber of Commerce, Columbus, Ohio, October 22, 1953

SINCE August 6, 1945, when the atom first burst on the world's consciousness with the bomb which rocked Hiroshima, the state of Ohio has contributed enormously to the development of the atom.

Up to now, most of that development has had for its object a strengthening of our defenses. That continues to be of paramount importance. And yet we also continue to hope that the atom will justify the sweat and toil that have been invested in it by leading to useful and significant peacetime applications for the benefit of the people of this state, the nation, and the world. Before getting into a discussion of the prospects for realizing that hope, it may be interesting to review briefly what work Ohio has done on the atom.

All of us have heard of the Portsmouth Area Project now being erected by the Atomic Energy Commission in Pike County; we have heard of the 1,000,000-kw Kyger Creek steam electric plant being built in Gallia County to supply a part of the power requirements at Portsmouth. It is not so well known that there are a good many other operations in the atomic program that are also located in Ohio. There is, for example, the Mound Laboratory at Miamisburg in Montgomery County, where highly classified, developmental work having to do with radioactive processes is going on. There is the Feed Materials Production Center at Fernald, west of Cincinnati, where the raw materials needed in the production of more concentrated fissionable material are processed. And there is also the project at the Evendale Plant of the General Electric Co. at Lockland, where work on design and development of a reactor for aircraft propulsion by nuclear power has been going on with increasing momentum.

Many of Ohio's leading industrial and engineering organizations have participated over the past half dozen years in atom development. I mentioned the General Electric Co. I might mention, too, the Babcock & Wilcox Co., The Austin Co., and the H. K. Ferguson Co. among others. Ohio's educational and research institutions are also playing a noteworthy part. Case Institute is carrying on classified work on a number of problems. That Institute, Ohio State, and the University of Cincinnati are among the group of midwestern universities which, with the University of Chicago, are acting as contractor for the Atomic Energy Commission in the operation of the Argonne National Laboratory, in Cook County, Ill.

The electric power companies of Ohio have for years contributed to the supply of power to the Atomic Energy Commission. By coordinating their operations they have been able to supply large quantities of electric energy to installations of the Atomic Energy Commission where fissionable material was produced, before permanent power facilities were completed.

Essential as this power supply has been, it is overshadowed by the obligation that the 15 power companies in the Ohio Valley area—seven of them companies serving the state of Ohio—undertook on October 15 of last year to furnish the entire requirements of the Atomic Energy Commission's Portsmouth Project. They have contracted to deliver 1,800,000 kw and 15,000,000,000 kwhr per year to this new diffusion plant of the commission. This is the largest contract for power entered into by a single customer in the history of the electric industry. It is almost two-thirds of all the power used in 1952 in Ohio, with its population of over 8,000,000 and its vast complex of industrial activities.

It is in connection with this undertaking that the 1,000,000-kw Kyger Creek power plant is being built in Gallia County. That plant will cost about $145,000,000; together with a companion plant, Clifty Creek, under construction in Jefferson County, Ind., and with the interconnecting 330,000-v transmission facilities, this will bring the total expenditures for the Portsmouth project for power supply alone up to $400,000,000.

Ohio, it can be seen, is very heavily involved in the atomic program. Many of its communities, thousands of its citizens, and close to $2,000,000,000 of capital—a substantial part of it private capital—are dedicated to work on the atom in this state.

As we get to know more about nuclear forces, and how to utilize their vast powers more effectively, Ohio will certainly continue to play a prominent part in that development and growth.

To date the benefits of the atom have been largely defense benefits. Most of the effort has gone into producing fissionable materials like uranium 235 or plutonium and devices that exploit fissionable materials in weapons like the atomic bomb, or atomic shells, or the hydrogen bomb. While it is a pity that we have had to concentrate on arms, nobody would suggest today that it would be safe for us to let up on the development and improvement of our atomic weapons. Atomic bombs may have an unpleasant sound, but we need them to help protect us against those who might otherwise be tempted to destroy us. The atomic bombs that we are producing, and to which Ohio is contributing so much, are perhaps the greatest single deterrent to our being overwhelmed by the world-wide communist menace.

When we turn from a consideration of the role of the atom in defense to the prospects for peacetime use, our major attention is immediately directed to nuclear energy as a new source of power. In pursuance of that interest it is natural and healthy to project our thoughts and our hopes into a future when this source of energy will have been so developed that it can take its place beside and perhaps even be more economical than the conventional forms, that is, those based on hydro or on fossil fuels—gas, oil, and coal.

Such a prospect is certain to excite the imagination of the people of this state with its constantly expanding economy — an economy that already uses almost two-thirds as much elec-

tric power as all of France, a nation with five times Ohio's population. Any development that can assure the availability of virtually unlimited amounts of energy and which would promise a more economical use of it is of vital interest to every inhabitant of the state.

Yet if we are to understand the significance of atomic power we must try to evaluate its prospects in practical terms. We must try to measure these prospects on some quantitative basis. If we are to answer the question of just how will Ohio benefit from atomic energy and its possible development in the near future, we must approach the question from the standpoint of first observing how the state has fared in the development of existing power resources and what are its prospects in this respect apart from atomic energy.

The United States has been in the forefront of electric power development for a long period. After all—thanks to the genius of a native of Ohio, Thomas Edison—electric power was born as an industry in this country nearly 75 years ago. One of the hazards of leadership is the tendency to grow complacent, to let younger, more vigorous competitors pull ahead while the original leader coasts on his earlier successes. We are fortunate in that no such complacency has developed in the electric power industry in this country. Evidence of our enterprise in this respect is apparent from many sources and nowhere better than from an examination of the world-wide expansion in electric power production that has taken place in the period 1940-1952. Canada's production expanded 106 per cent, France's 114 per cent, that of the United Kingdom 117 per cent, and that of Soviet Russia—with all its series of five-year plans—150 per cent. In the same interval the United States increased its power production 180 per cent. In the same interval expansion in electric energy production in the state of Ohio has proceeded at an even more rapid rate than the national average. Comparison of the figures of per capita energy production yields striking results. All the following data are expressed in round numbers. In 1952 the per capita sales in the United States as a whole were 2,200 kwhr, based upon sales of 340,000,000,000 kwhr, to a population of 157,000,000. In the same year per capita sales in Ohio were 2,900 kwhr. Ohio thus stands out with a per capita energy use one-third above the national average.

The source of this energy used in Ohio is also significant. Small quantities are generated by hydro plants or from utilization of oil and gas. But these quantities are negligible. Ohio is in a singularly favorable location with relation to coal resources, and nearly 99 per cent of its total requirements of electric energy are generated from coal. It is itself one of the great coal producing states, having had an average output of close to 35,000,000 tons annually during the last 12 years. With its borders on Pennsylvania, West Virginia, and Kentucky, Ohio is practically in the heart of the great Eastern Coal Province, which at present produces about 85 per cent of all the bituminous coal mined in the United States. As long as there are adequate coal reserves within the Eastern Coal Province, Ohio can look forward to an ever expanding use of energy without going beyond the resources of its own mines and those of neighboring states.

There is no agreement even among geologic experts as to what these reserves are. But it is well to note that disagreement is as to whether the reserves are adequate for the next 2000 years or only for the next 300 years. If recent judgment has veered toward the lower figure, at least there is no disagreement that in this region reserves adequate for the next several hundred years are available and have been proven.

Other parts of the world, of course, are not so well situated with respect to conventional fuels. Indeed, even parts of this country—which in the main has thus far been favored with fairly well distributed, relatively plentiful sources of economical energy—will begin to face materially increasing costs in coming decades as the best deposits of fossil fuels are exhausted. In short, because of Ohio's situation with respect to coal, it is not likely to benefit from atomic power as soon as other parts of the world or other parts of this country which are not so ideally located near conventional sources of energy.

Now, what is the status of energy production by atomic fuel?

There has been a great deal of talk about atomic power in the last several months. One can hardly pick up a copy of the daily paper without finding an article or a report of a speech about it. The Joint Committee on Atomic Energy of the Congress held extensive hearings on the subject during the last summer and published a full account of these hearings. The object of the hearings was to determine what the facts were with regard to the possibilities of developing atomic power, what the various sections of our society thought about the problem, and, particularly, what private industry might be able to do to develop atomic power and bring about its peacetime use. These hearings make it rather clear that commercial atomic power is not just around the corner and that very hard, very expensive time-consuming work remains to be done before commercial power can be a reality.

It is important to avoid any confusion about the technical feasibility of atomic power. Atomic power in that sense is here: that is, we can produce power from the fissioning of atomic material—such as the material that will be produced in the Portsmouth Area Project when it starts operating in about a year or so. Technically this has already been accomplished. A reactor adequate to drive an advanced-design submarine, the *USS Nautilus*, which is well along towards completion, has been built and is operating experimentally at the National Reactor Testing Station at Arco, Ida. The keel of a second submarine, the *USS Sea Wolf*, has been laid and it, too, will be driven by an atomic power plant of a somewhat different design than that which will power the *USS Nautilus*. Other reactors for the propulsion of naval war vessels are in process of development. And any one of these reactors could be put to work to generate power for peacetime use in the home, on the farm, and in industry in Ohio—except for one thing, the item of economics.

The Chairman of the Atomic Energy Commission put the matter very succinctly in his remarks a few weeks ago:

> Power reactors have been built and they work. Before another year rolls around, the *USS Nautilus*, our first atomic submarine and the first mobile atomic power plant, will have had her trial runs and will be in the list of operating Naval units. She will shortly be followed off the ways by the *USS Sea Wolf*.

But Chairman Strauss then added this important qualification:

> The Naval atomic energy units do not have to meet present competition with diesel fuels, of course, because of other great tactical advantages of atomic power plants. These include the ability to operate submerged for long intervals, and to cruise at speed for many thousands of miles without refueling. On the other hand, civilian atomic power must justify itself by being competitive in cost with present power sources.

So we see that while atomic power has been proved, atomic power that can take its position in the market place and meet the test of competition with other forms of energy is another matter. While it is not likely to be here for some time to come, that does not mean that a great deal of work is not going on to help develop it. Research and development looking toward that end is proceeding at many of the National Laboratories: at Brookhaven, Knolls, Oak Ridge, Argonne, and at locations like Bettis Field and the National Reactor Testing Station at Arco. A number of impressive foreign projects are under way: in England and in Norway reactors are in process of construction, having as their objective the development of atomic power for land or peacetime use. And the last session of Congress authorized the Atomic Energy Commission to spend up to $7,000,000 appropriated for research and development for the beginning of construction of a land-based reactor for ordinary electric power production. But no one who is familiar with power reactor technology believes that this reactor, or any other first reactor, would be able to produce electric power that approaches in cost power produced by more conventional means —in Ohio that means burning coal.

Why is this so? Very simply: there are still a great many technical problems to be solved in reactor design, in reactor vessels, that is, the shells or drums housing the reactors, in design of atomic fuel elements, heat transfer systems, fuel element life, fuel reprocessing, valving, controls—the list could be greatly extended—before we can bring the cost of reactors and atomic fuel down to the point where the energy they produce is competitive with conventionally produced electric power. And I should reemphasize that this is especially true in an area of abundant and economical coal supply like Ohio. In a good many parts of this state it may be a long time—perhaps decades or more—before atomic power is competitive with coal-produced electric power.

In attempting to solve many of the still unsolved problems we find that there is simply a bewildering number of possibilities in reactor design, each of which can produce the same technical results but with different economic advantages. The attractiveness of each and the economic evaluation of the positive and the negative features are probably impossible of assessment until actual systems have been built and operated. And the solution of the main technical problems which confront us will probably not be achieved except in the process of building and operating actual reactor systems.

Unfortunately, the building of nuclear reactor systems is a very expensive operation. However, we have now reached a stage of development where it appears probable that within a fairly short time this country will be well along on the way to building one or more of such test reactors designed to produce electric power. When the time for building these comes, I believe that the power companies in Ohio—and The Ohio Power Co. in particular—will take their place and contribute their share to help solve these problems and help develop these prototype reactors.

In our own case, we have always felt that, as an electric utility—serving some 540 communities in this state—we have a responsibility for everything having to do with the production and distribution of power and in the improvement of the art relating thereto. And so we are not only deeply interested in this subject but we are prepared to devote currently a substantial amount of money and talent to developmental work in the field. Just within the past few weeks, an announcement was made of the formation of a new five-company industrial study team known as Nuclear Power Group which has been approved by the United States Atomic Energy Commission. American Gas and Electric Service Corp., the engineering and service organization of The Ohio Power Co., is one of the five companies comprising this group. The initial objective of the new group is to select a reactor design intended primarily for the production of electric power that can be built in the near future, and to make a preliminary economic appraisal of such a design.

For the immediate future, therefore, I feel that our contribution should, and will, be on a scale appropriate for research and developmental undertaking, which will doubtless include moderate experimental projects. In this research and developmental work, in which, as I have indicated, we are already taking part in considerable measure and which will expand as time goes on, we expect to continue to collaborate with other concerns from our own industry in Ohio and other states and with other industries and with the government. This work is all part of a program out of which, some day, commercial development of electric power based upon atomic energy may open up and, therefore, development by private enterprise. When that time comes I believe that we and others in this state will be in the forefront of such activities.

In the meanwhile, what might Ohio —its people—do to assure its position with respect to energy availability and expansion for old and new uses? This question is not only difficult to answer but it would perhaps be rash of me to attempt it here. But when I consider all of us concerned with the welfare of Ohio, all of us tied together by a common concern for its further progress, prosperity, and well-being, I think we can look at the basic policies affecting energy supply followed in the state with considerable satisfaction. It must be that these policies have contributed tellingly to the outstanding position that Ohio occupies today, power- and energy-wise, in this nation and in the world.

The policy of support and help for coal mining activities, proper support and fair regulation of utilities, support and expansion of the state's educational institutions where the technicians and leaders of existing and new technologies will have to be educated and trained—all of these policies have brought about Ohio's present enviable position. It is only reasonable to expect that a continuation and improvement of these same

policies will assure the availability of materials, manpower, and capital to carry on the important task of energy supply with existing technologies.

And, while actively supporting programs of expanding and improving existing power systems and technologies, we cannot stand still, but to do our job well we must also—to paraphrase the President of the United States in his recent Atlantic City speech—try to reduce the titanic force of the atom to the fruitful service of mankind. Such a policy and program will give assurance that when the time comes that atomic energy has developed and can be beneficially put to work, it, too, will be available without loss of critical time to function creatively in the interest of all the people throughout the length and breadth of Ohio.

Snakes, Lions, Enliven Meter Reader's Day

Harmon Kallman
Denver Post Staff Writer

The following tribute to Public Service Co. of Colorado metermen began with a picture on the front page of the October 13 Denver Post *and was continued on page 3 under an eight-column heading.*

READING gas and electric meters would seem offhand to be a slow way of passing the day. Same clocklike faces to look at every hour, every week. Same runny-nosed youngsters who inquire, "Whatcha doin' mister, huh, whatcha doin'?" Same dowdy housewives scraping burned toast in the morning and fingernail polish in the afternoon.

But listen to a lanky young fellow named Ted Fuller, an ex-meter reader now in the publicity department of the Public Service Co. of Colorado and a connoiseur-collector of Denver meter reader adventures:

"There is an infinite variety of things that can befall a Denver meter reader." He cites these as examples:

Al Johnson, then a meter reader, glanced under the kitchen sink of a northeast Denver home and saw a lion. The lion saw him. Johnson was making about 60 in the opposite direction when the householder intercepted him.

"It's all right, he's just a pet," she said. "Anyway, he's chained to the drainpipe."

Johnson did not laugh. But he persuaded the lady to escort him back into the kitchen to retrieve his meter book and flashlight. The lion, six months old, had been bought from a bankrupt circus in Kansas, complete with teeth and claws.

Roman Leiker, another meterman, once succeeded in firmly pressing the calf of one leg between the jaws of a large Westwood mongrel. The hound liked the arrangement. Leiker hollered. Out came the dog owner, toting a shotgun.

"Hold that misbegotten creature still, where I can get a shot at him," yelled the pet owner to Leiker, in words more colorful than those given here. "He's caused me enough trouble already."

Leiker noticed that the gun was pointed in his direction, though the dog was the target. He talked fast, meanwhile getting a half nelson on Rover, and threw the beast from him. It was done so quickly that the dog lover never got to take aim at his canine. That perhaps is why Leiker was treated only for dogbite.

Another Denver meter reader was set upon by monkeys in a dark northside cellar. One lower downtown night spot that featured a snake act kept its performers in the basement, near the meter. Many meter readers have had mice run up trouser legs.

George Arnold, a company veteran who used to read meters in a rowdy lower downtown district in the early 1930's, had to visit several houses of doubtful repute. About that time, too, the company decided its meter readers should wear caps resembling police headgear.

The inevitable happened one day when Arnold knocked on the door of one of the more prosperous establishments. The lady in charge opened the sliding peephole in the door, saw Arnold's dark cap and hastily rang a buzzer that signified, "Cheese it, the gendarmes."

Routine was upset for the rest of the day.

Looking at a gas meter under the floor of a house with a half basement on S. Steele St., Eddie Butz saw a poisonous Gila monster two feet long. Two children were playing in the yard. Butz firmly closed the trapdoor, asked the lady of the house for a shovel, reopened the door and decapitated the lizard. The lady wrote the company a grateful letter.

It means immediate dismissal to be caught curbstoning—sitting on a curbstone and guessing at a customer's bill instead of going inside. But the practice was excused in the case of one meter reader.

"They got 40 cats in that house and I got a weak stomach," he complained. "I can't hold my breath long enough to get in, read the meters and run out again."

Dogs are a daily hazard, and the company earnestly solicits customer cooperation in protecting its men. Even so, the average month brings three dogbites among the 63 meter readers. It runs in cycles: last week, four dogbites in two days; this week, not a bite yet.

Some meter readers get by for years without serious incident, but one recent employee ran this gamut in six months: four dogbites, an assault by a flock of geese, a nudge by a friendly horse that threw the meter reader off balance and sprained his ankle, and a trapdoor slammed shut by a sassy youngster, skinning the fellow's arm. He has since transferred to another PSC department.

Animals are exuberant, but people can be downright mean. One Park Hill housewife a few years ago charged a meter reader with stealing diamond jewelry. When the whole story came out, it developed that she had given the bauble to her boy friend and dreamed up the theft so her husband wouldn't find out what she had done.

Most customers are reasonable, however, once they understand the meter reader's problems.

Chuck Cooke, head of the department, tells about one customer's large dog that pushed through a door, nipped the meter reader, and scared him half to death. Aroused, the PSC man went after the dog with a broom. The customer told her husband, who indignantly called the company.

The meter reader's supervisor recounted the whole incident, and ended by asking, "Now, what would you have done, Mr. Smith?" The customer drew a deep breath and admitted:

"I guess I'd have killed the hound. I'm sorry."

All this, says Cooke, indicates most customers will meet a meter reader halfway. And if a customer doesn't, Cooke tells his meter readers, "Just keep on walking and say 'Thank you' to whatever he says."

Public Utilities—Fair Rates for Customers and Investors

Robert P. Briggs
Executive Vice President, Consumers Power Company

An address before the Michigan Accounting Conference, University of Michigan, Ann Arbor, Mich., November 6, 1953

THERE are many accounting implications in the regulation of public utilities, and accounting leaders should be conscious at all times of the importance of having healthy public utilities which are ready and able to serve the needs of our citizens and industries. In order to serve the needs of Michigan, public utilities must be financially strong. They must be allowed a rate of return that will permit the payment of interest and dividends sufficient to attract investors to their securities.

The utilities have a three-fold responsibility: they must treat labor fairly and pay competitive rates and salaries; they must treat their customers fairly and provide good service at a reasonable price; and they must treat capital fairly and manage their financial affairs so as to merit investor confidence.

Utilities are subject to regulation by state and Federal regulatory bodies, and properly so. For proper regulation, accounting processes must be employed to establish the price of the commodity.

Accounting processes provide the facts and figures for the information of management and investors as in the case of unregulated business. Similarly, information must be compiled and presented to the securities regulating authorities and taxing authorities as in other businesses. Also, the accounting data must be analyzed and interpreted in order that the general public may have an understanding of the operations as is its right in all businesses.

To the above must be added an accounting requirement which increases the responsibility of accountants in the public utility field. Accountants must assist management in supplying accurate, complete, and generally uniform data on utility operations which can be submitted to regulatory commissions and used by them in approving what constitute, in their judgment, proper rate schedules.

The major conflict in the world today between the concept of private property and the ideology of the superstate justifies a review of the history of public utility regulation. Regulation of public utilities represents an inroad by the state on the free right of business to handle its own affairs. The objective of regulation in our competitive society is for the regulatory body to exercise controls which achieve the functions normally gained by competition. Let us examine the background of utility regulation and determine the current status of regulatory bodies.

Regulation and Fair Value

The earliest common law has long held that there are certain business undertakings which, within the social framework of the times, created special obligations in the public interest. In applying this rule in Munn v. Illinois, an 1877 case, the court said: "We find that when private property is 'affected with a public interest,' it ceases to be juris privati only . . . Property does become clothed with a public interest when used in a manner to make it of public consequence, and affect the community at large. When, therefore, one devotes his property to a use in which the public has an interest, he, in effect, grants to the public an interest in that use, and must submit to be(ing) controlled by the public for the common good to the extent of the interest he has thus created."[1] It was thus determined that regulation of an activity affected with a public interest was encompassed within the police power as an inherent right of a sovereign state.

The creation of agencies to set up and enforce regulating legislation was challenged as an unconstitutional delegation of legislative power in Reagan v. Farmers' Loan and Trust Co. in 1894. The Supreme Court met this argument by noting that there was in fact no delegation of power, but rather that the commissions thus created were merely administrative boards which served to carry into effect the legislative will.[2]

A second important principle was enunciated in the Reagan Case, that of judicial review. The court had up to that time dodged the question of the reasonableness of regulation by asserting that the remedy against legislative abuse lay in the polls, not the court. In the Reagan Case the court faced the problem squarely and concluded that it had both the power and the duty to review all legislative and commission findings as they affected public utilities.[3]

The Supreme Court in 1898, in its search for a measure of reasonableness, formulated the now famous rule of the case of Smyth v. Ames.[4] The court stated: "We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged . . . must be the fair value of the property being used by it for the convenience of the public. And, in order to ascertain that value, the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property . . . and the sum required to meet operating expenses are all matters for consideration, and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property. What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience."[5]

And so the rule remained for nearly 50 years. In case after case, the Supreme Court reemphasized the rule of present fair value. A significant change in the attitude of courts and

1. Munn v. Illinois, 94 U.S. 113 (1877).

2. Reagan v. Farmers' Loan and Trust Co., 154 U.S. 362, 393 (1894).
3. Ibid., p. 399.
4. Smyth v. Ames, 169 U.S. 466.
5. Ibid., p. 546.

commissions toward questions of fair value, original cost, and various other philosophies was expressed when the Supreme Court decided the case of Federal Power Commission v. Hope Natural Gas Co. in 1944.[6] In that case, the court declined to set aside the order of the Federal Power Commission, which was based upon original cost as contrasted to fair value, and held in substance that the basis of value was not controlling as long as the end result of the order was found to be reasonable. However, the actual determination was made on the basis of original cost and has had such vigorous Federal Power Commission application that many people today have come to believe that it is the universal basis upon which rates should be fixed. This is not true. The decision in the Hope Case is nothing more than a judicial interpretation of the requirements of the Federal Natural Gas Act. This act does not provide a statutory formula for arriving at a rate base, other than saying: "The commission may investigate and ascertain the actual legitimate cost of the property of every natural gas company, the depreciation therein, and when found necessary for rate-making purposes, other facts which bear on the determination of such cost or depreciation and the fair value of such property."

Michigan, despite the fact that it is listed by the Federal Power Commission as an "original cost" state, has not discarded the fair value approach to valuation. In 1945 the commission had before it an electric rate case where the commission characterized the utility's proof on present-day fair value as "hypothetical calculations of little probative value." The commission found the proof to be insufficient and speculative and then proceeded to fix the rates on an original cost rate base less depreciation.[8] In two subsequent cases, the commission prescribed rates based upon the original cost theory.

However, on January 12, 1950, the commission rendered an opinion in the electric rate case of Consumers Power Co. in which it stated: "In this proceeding the matter of the proper approach to a rate base has been vigorously challenged to the attention of the commission. We have been urged in most forceful language, both in oral argument and in the brief filed by the company, to pay heed to the statutes and decisions of this state; and, in compliance therewith, to determine and adopt a rate base which is the present fair value of the property of the company used and useful in its business as a public utility.

"Because of apparent confusion upon this subject in this, as well as in other rate cases before this commission, and because of the expressed belief on the part of even members of the commission staff that this commission is committed to the doctrine of original cost or prudent investment, we believe that it is high time that this matter should be decided and announced once and for all."[9]

The commission then reviewed those cases which appear to support the original cost doctrine and pointed out that in the 1948 Michigan Bell Case the company presented its entire case upon the original cost theory. In fact, it was stipulated that no evidence of any other value would be presented.[10]

The commission also pointed out that in a second case, the 1949 Detroit Edison Case, although evidence was presented in support of values other than original cost, the commission sought to demonstrate in its decision that the original cost value was being used merely as a test of the reasonableness of the rates determined by the order.[11] Then, after a review of the significant changes brought about by the rendering of the decision in the Hope Case, the commission stated: "From our view-point, however, we cannot indulge in a choice between the fundamental philosophy of original cost on the one hand and fair value on the other. We believe that we are directed, not only by the Legislature, but by the Supreme Court, in the course which we are to pursue upon this phase of this troublesome question. In other words, both our Legislature and our Supreme Court have told us that we are to operate upon the basis of fair value.

"We are considering this question at a time in the economic history of this country when we are experiencing the most violent inflationary period of our national life. The evidence shows that the facilities and property of this utility have been constructed and acquired over a period upwards of 35 years and it is incredible that fair value measured in 1949 dollars is not in excess of the original cost of construction or acquisition."[12]

The Michigan Commission thus made it clear that the Hope Case was an interpretation of a particular Federal statute and that it, the Michigan Commission, was committed both by state statute and by court decision to a fair value rate base.

The original 1909 legislation covering electric utilities used the following language:

"The commission shall consider and give due weight to all lawful elements proper to be considered to enable it to determine the just and reasonable price . . . including . . . reasonable return on actual value of all property used in the service . . ."[13]

This was amended in 1921 to substitute for the word "actual" the word "fair" so that the statute read "fair value."[14] This substitution is significant since by that time the term "fair value" had attained a well-defined meaning under the decisions of the Federal and state courts, including the Michigan Supreme Court.

With respect to gas utilities, the Michigan statute neither delineates the elements of value to be considered nor uses the phrase "fair value." However, the basic statute of 1909, Act No. 300, provides that the rates are required to be "reasonable and just." None of the statutory provisions creating the successive Michigan regulatory commissions defines the basis by which it is to determine a reasonable and just rate or arrive at a valuation for rate making for gas utilities. However, the Michigan Supreme Court has interpreted the commission's powers of valuation for railroads, telephone utilities, and gas utilities as requiring consideration of substantially the same elements of value as are required by statute for electric utilities.[15] This latter act provides that the commission shall consider all lawful elements to determine just and reasonable rates, including:

Cost.
Reasonable return on fair value.
Depreciation and obsolescence.
Risks of the business.
Value of the service to the consumer.
Connected loads, hours of service, and quantity used.

6. FPC v. Hope Natural Gas Co., 320 U.S. 591 (1944).
7. 15 USCA Sec. 717e (a).
8. Re Detroit Edison Co., MPSC 1945 Orders and Opinions, p. 127; City of Detroit v. Detroit Edison Co., 59 PUR (NS) 1, 11.
9. Re Consumers Power Co., 82 PUR (NS) 97, 104.
10. Ibid., p. 107.
11. Ibid., p. 107.
12. Ibid., pp. 107, 108.
13. Act 106, PA 1909, Sec. 7.
14. Act 274, PA 1921, Sec. 7; MSA Sec. 22.157.
15. Detroit R. Co., v. Railroad Commission, 171 Mich. 335 (1912); Michigan Public Utilities Commission v. Michigan State Telephone Co., 228 Mich. 659 (1924); PUR 1925C, 158; Re City of South Haven, PUR 1923A, 711; Re Michigan Consolidated Gas Co., 1940 MPUC Orders and Opinions, 646, 660.

The conclusion is inescapable; Michigan is a fair value state based upon statutes, court decisions, and the pronouncements of the Michigan Commission.

Fair value is a realistic value of the properties committed by the public utility to the public interest. It is a judgment figure to be determined by a prudent commission after a careful weighing of the elements of original cost, reproduction cost, and other economic factors.

Through the use of continuing property records, accountants can supply original cost. A determination of reproduction cost requires the services of engineers trained in utility appraisals. Utility properties are not traded on the open market and, therefore, cannot be valued simply by a glance at the financial pages. As in unregulated business, the cost of reproducing plant is an important factor which should be considered in determining the price of goods or services.

Another element specified is the value of the service to the customer. If the value of the service is low compared to its selling price, no more than a nominal return on any rate base may be feasible. However, where the value of the service is high in relation to the selling price, and the price may be increased with commercial practicality, then it is necessary to consider all of the elements which are relevant in the determination of fair value. Certainly this is true in regard to electric and gas companies.

When a company is able, by reason of efficient and economical management and foresight, to supply services equivalent to those supplied by neighbor companies at equal or lower rates and, at the same time, is capable of earning a higher return, it is self-evident that the value of such a utility in relation to the cost of its physical plant must also be proportionately higher. It is also apparent that as general price levels change, the reflection of such changes in the value of the property will be different for different utilities, depending upon the actual earning ability of each under comparable rate levels. Utilities are as different as human beings, and there is every reason to expect to find varying results among utilities, but each is entitled to a fair return on a fair value.

However, utilities as a whole have not succeeded in earning a fair return in the inflationary period of the last dozen years. As of August, 1953, the Consumers Price Index of the Bureau of Labor Statistics had risen by 93.6 per cent over 1939. For the same period the gas and electricity component of the index had risen only 1.9 per cent. This means that while the unregulated industry was adjusting its price structures to roll with the punch, the regulated gas and electric industries were not allowed to keep pace with inflation. It is true that larger demands for electric power and increasing skill and efficiency in its production have helped keep costs down. But to expect increasing volume and better generating efficiency to offset fully increased costs is a vain hope. Even the most advanced techniques have not held back the steady attrition of investors' capital through rates which did not realistically reflect the decline in the earning power of the dollar. Economically speaking, the present rates do not preserve the physical plants. This is largely due to the adherence to original cost for rate making purposes.

Inflated Dollar Here to Stay

The original cost proponent insists that application of an original cost rate base will average out with the cyclical variations of our economy. Many economists believe that the present inflated dollar is here to stay and that the most we can hope for is a semistabilization of the dollar near its present level.

It is generally recognized that the rapid rise in wages has resulted in a permanently higher labor cost, and since labor is such a significant factor in commodity cost, we can conclude that we have a permanently higher level of prices.

Dr. Paul W. McCracken recently testified before the Michigan Public Service Commission that unit labor cost stands at an index of 203 in 1953 compared to 100 in 1940.[16] This unit labor cost is a reflection of two factors:

1. The 1953 wage index which is 264 based upon 1940 as being 100.
2. The 1953 output per man-hour index which in 1953 is 130 compared to 100 in 1940.

From these two facts he established a unit labor cost of 203 for 1953 compared to 100 for 1940. It is significant to note that a unit labor index for 1953 of 203 is quite comparable to the Consumers Price Index of 190 for 1953 using 1940 as a base. Quoting Dr. McCracken directly, "One point is clear, the rises in the price level and in unit labor costs have been about the same. Both have roughly doubled. The price level has simply been making the normal adjustment to current cost levels."

Dr. McCracken then drew a conclusion with which I heartily agree: "Those who hold the view as I do that the present price level is here to stay do not mean that the consumer price index will never move again. A boom might force the price level higher than at present, but under the downward pressure of a recession, the consumer price index might drop below current levels. My point is that the level around which these short-run fluctuations will occur will be about the level prevailing at the present time."[17] To my mind we have reached a new plateau of price relationships and that plateau as a general price level is permanent, above and below which there will be the usual price fluctuations. And the new, lower valued dollar which emerged from this period of inflation is also permanent.

There has been a reluctance on the part of many regulatory agencies to admit that the value of the dollar has changed for keeps. The dollar has already gone halfway to zero, and we wonder how much farther it will have to decline before they accept it as a fact. The accounting profession is showing increasing interest in the subject, and such leaders as Dr. W. A. Paton have stood up to be counted in the ranks of those who believe that public utilities must have compensation for the expiration of the value of properties utilized in producing their services in terms of the current dollar, adjusted to reflect its depreciated value. Some people think the problem is not serious. They assume that all the utility needs to do is to apply for rate increases and that these will be automatically granted. Such is not the case. Even when rate increases are granted, they come only after a company has bled and has actually sustained an impairment in its earning power. The time consumed in a rate case is so long that the lost earnings constitute a significant sum of money which is irretrievably lost.

The judicial standard to be applied in order to determine whether or not a rate of return is adequate is a problem which has vexed the courts and commissions since regulation began.

16. Re Michigan Bell Telephone Co., MPSC Docket No. T-252, Transcript p. 618 (July 23, 1953).

17. Ibid., p. 621.

The case of Bluefield Water Works and Improvement Co. v. West Virginia Public Service Commission squared off on this question of reasonable return and established that a utility is entitled to rates which will permit it (1) to earn a return equal to the return generally being made by other business attended by corresponding risks and uncertainties, and (2) to earn a return sufficient to assure confidence in its securities.[18]

The court said a utility is entitled to such rates as will permit it to earn a return on its property used for convenience of the public, and such return to be ". . . equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties . . . ." Likewise, this return should be "sufficient to assure confidence in the financial soundness of the utility and should be adequate under efficient and economical management to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties."[19]

Is regulation, as we know it, accomplishing these ends?

A Circuitous Process

In determining earnings for an electric utility a commission considers the earnings of other utilities of comparable size and similarity of location. In determining earnings for pipelines the commission reviews the earnings of other pipelines, and the same is true of gas distribution companies. I submit that this is basic error. For a commission to relate the earnings of one company to the earnings of other companies, all of which are regulated, is a circuitous process. It enables a regulating body to set the beginning and the end and does not allow a play of normal market forces.

A realistic standard for utility earnings should be the earnings which market forces permit to other businesses having a similar risk factor.

The capital structure of a typical utility company is characterized by a high percentage of senior capital—bonds and preferred stocks, obligations which call for the payment regularly of fixed sums. So, while it is true that the cyclical fluctuations of the economy affect utilities to a lesser degree than unregulated business, such fluctuations can leave a heavy mark on utility equity investors. As to the holder of common stock in a utility, the free play of market forces places him in the same risk position as the investor in unregulated business. In other words, almost the entire risk attendant to the enterprise falls on the equity holder.

The second important holding in the Bluefield Case is that a company's return should be sufficient to assure confidence in the financial soundness of the utility and should be adequate to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.

We all accept the fact that this country's industrial might is based to a large extent upon its utility services. Without modern transportation and communication, today's industries couldn't have the modern technique of mass production. The availability of increased amounts of natural gas has given us new industries and new industrial processes. Likewise, the forward planning of the electric utilities has made available to industry tremendous amounts of power ready to use at the time and place required. Almost without exception, the introduction of each labor saving device has been dependent upon the availability of power.

The use of natural gas has increased in the decade 1940-1950 by 138 per cent.[20] The electric utilities more than doubled their output over the same period of time, and in 1952 the industry produced 181 per cent more kilowatthours than it did in 1940.[21] In 1952, new construction cost the investor-owned electric industry $2,599,000,000.[22]

Since a regulated utility is unable to generate internally sufficient funds to meet expansion requirements, it is obvious that the necessary additional funds must be acquired largely through security sales in the open market. If the utilities are to continue to attract investor capital, they must earn a return sufficient to satisfy the investor's market requirements and compensate him for risking his capital. Nothing less will do, unless we are willing to give up the free-enterprise battle and turn the utility field over to the government and henceforth have socialized utilities, in short, give the tent to the camel whose head is now inside the door.

If a commission establishes a fair, fair rate of return and applies it to a fair, fair value rate base, the product will represent a proper return to the public utility involved. It has been suggested that an original cost value can be combined with an inflated rate of return to produce a proper allowed net income for the utility. Theoretically, the product of x times y can be adjusted by adjusting either x or y, in our case either the value or the rate of return. However, practically, it is just as difficult to adjust either factor, and commissions should forget any idea of accomplishing justice by clinging to original cost with the hope that they can grant a sufficiently high rate of return to result in the utility having proper net income. It just does not happen.

Depreciation Expense Understated

One of the major expenses of a public utility is the measurement of the current expiration in value of the physical plant that has been consumed during the accounting period under review. The recognition of depreciation expense by a public utility on the basis of conventional methods of writing off in a given year a portion of the original cost without correcting for the change in the value of the dollar has been in recent years a gross understatement of the operating expenses of the public utility. One private study indicates that depreciation expense claimed by electric, gas, telephone, and telegraph utilities in the year 1951 failed to reflect the true economic loss in value in terms of 1951 dollars by almost $500,000,000. The original dollar cost of these plants was some $56,000,000,000.

We write off coal in terms of its current cost. Yet that coal is used in a boiler which activates the generator and turbine, and the expiration of value recognized for the boiler, generator, and turbine is a fraction of the original-cost dollars and not a recovery of the fair measurement of the economic value that has been consumed in the generation of electricity during the current year.

Public utilities must recognize the current value of the property consumed just as they recognize the current cost of labor, material, and other expenses. Commissions must recognize the propriety of public utilities

18. Bluefield Water Works and Improvement Co. v. W. Va. PSC 262 U.S. 679 (1923).
19. Ibid., 692, 693.
20. "Gas Age," February 12, 1953.
21. "Electrical World," January 26, 1953, p. 159, quoting Federal Power Commission as source.
22. Edison Electric Institute "Statistical Bulletin for the Year 1952," p. 51.

recovering in terms of today's values the portion of the plant that has expired as a result of today's operations.

Simply expressed, the depreciation of a generator installed in 1939, and paid for in the 100 cent dollars of 1939, must be measured in 1939 dollars and then converted to the equivalent number of dollars in the year the depreciation is being recognized.

Under nonconversion of dollar practices, the true cost of plant consumed in operations is not matched by the revenues collected from customers. Each year of operation under present conditions results in the giving to each customer a portion of the plant. Utilities cannot continue to be Santa Clauses.

In accounting for the use of inventories of materials and merchandise, accountants use the last-in—first out procedure which permits a taxpayer to assign to goods sold the cost of the goods most recently acquired. This is a recognition of rising costs, and by its unavailability to the industries having large, fixed physical assets, represents an inequity which places the latter at a serious disadvantage.

Most services and goods are bought on a current basis, that is, today's prices in terms of today's dollars. If a utility sells its services at a composite cost of today's costs and yesterday's costs of a higher valued dollar, the customer is simply not paying his way. The actual value of plant consumed should be charged, and that value should be computed through the use of indices similar to our present consumers' price index. This would, in effect, state the actual cost of plant consumption in the current year in terms of current dollars.

Regulation Trends

There need be no compromise with the essentials of good accounting procedures, only an acceptance of the fact that the dollar is not a stable element. I am not recommending that property accounts be restated in terms of current dollars. I am suggesting that there be a conversion to cost of the consumed capacity to equivalent current dollars as plant service is consumed from year to year. Such a conversion would be precise and not arbitrary; it would accurately measure consumed plant from year to year and charge revenues with the cost of that consumption.

Unfortunately, the problem still is in the discussion stage for most economists and accountants. The governmental agencies continue to oppose any suggested changes in procedures; hence the literal confiscation of private capital continues. This must end.

Over the past few months both the courts and commissions have indicated a growing awareness of the impact of inflation on utility operations. In a recent case the Illinois Supreme Court rejected a commission finding that the fair value of a telephone company's property was original cost plus 6 per cent and directed the commission to take into consideration "Current economic conditions, price levels and reproduction costs . . . ."[23]

The Florida Railroad and Public Utilities Commission has taken recognition of the fact that rising costs, coupled with the lag of regulation, may reduce utility income to the level of confiscation.[24]

Most heartening of all is the observation by the National Association of Railroad and Utilities Commissioners that the ranks of the "value" states, as distinguished from "original cost" states, have increased until about one-third or more of the state commissions give some recognition to current cost factors in finding a rate base.[25]

These signs are encouraging, but only an optimist would as yet label them a trend. They indicate, however, that the processes of regulation are recognizing the economic guideposts of these dynamic times.

Government a Powerful Competitor

Through Rural Electric Cooperatives and many hydro projects, our government is a powerful competitor in the electric power business. The Tennessee Valley Authority has grown to a point where there is no longer any pretense of flood control and navigation improvement as a test for the propriety of a proposed expansion. TVA is openly in the business of making and selling power and has an investment approaching $1,600,000,000. This is open competition from a government agency which borrows money at an interest rate less than half what the Federal government actually pays; does not have costs of floating equity capital; makes a payment in lieu of state and local taxes at less than half the rate paid by the average investor-owned company; and pays no income taxes.

With this background of subsidy and through the simple expedient of not reflecting on its books the interest payments of some $25,000,000 annually, paid by the treasury on its behalf, TVA represents a real competitive force. And through the application of the preference clause of the Flood Control Act of 1944, the impetus is provided whereby the rural electric cooperatives can expand their systems in direct competition with investor-owned taxpaying utilities.

If you happen to be an individual who thinks there is nothing wrong with the Tennessee Valley Authority in an economy that has won its spurs as a free-enterprise system, let me ask you what you would think if you were a pickle canner, and let's assume sweet pickles were being canned, and the government decided to have a TVA project to process pickles. Of course, the invested capital would be provided by the government. The authority would pay no Federal taxes, only token local taxes, receive free advertising, free legal services, be charged no interest, and might even occasionally receive a grant from the government to pay some of its operating costs. Would you as a pickle processor feel that private enterprise was being dealt with fairly when a socialized competitor supported by public taxes competed with you in the market place?

Originally, the generation of public power allegedly was incidental to the objectives of TVA. Today, a firm supply of power is necessary since private power companies have been driven out of the area and the government has a complete power monopoly. This benefit for Tennessee Valley inhabitants comes from the pockets of the people of all the states. What this can lead to is shown by Governor Dewey's recent insistence that New York should have a power authority to siphon back to New York some of the hundreds of millions of dollars its people pay to the Federal treasury. This is socialism on the prowl.

Future for Free Enterprise

A strong and stable America can continue only if the principles of free enterprise can be applied in the future as they have been in the past. It has been traditional of our economy that private capital is quick to develop any feasible new process or technique which will do the job better or more

23. Illinois Bell Telephone Co. v. Commission, 111 NE (2nd) 329 (1953).
24. Re Florida Power Corp., 99 PUR (NS) 129.
25. Report of Committee on Valuation, NARUC, Sept., 1953, p. 5.

cheaply. Recently the application of nuclear power to the production of electricity has opened a whole new field which should be studied and probed by all the tools available to industry. The fact is, however, that the Atomic Energy Act of 1946 vests complete control over all atomic development in the Federal government. The utilities have taken a bold stand on the issue of nuclear power in the belief that this new and potent force ultimately can be economically harnessed for peaceful uses by the active and free participation of America's business and industry.

I have heard it said that some projects are too big for private capital. Anyone believing this has failed to appreciate how private capital has expanded its means. At Joppa, Ill., five business-managed electric companies have undertaken a $100,000,000 electric generating plant to serve a government uranium plant across the river at Paducah, Ky. A $400,000,000 project is under way near Portsmouth, Ohio, under the ownership of 15 other utility companies. The electric industry is willing and able to undertake any sound electric supply project.

The effect of this new supply of energy on our economy is not too clear. We do know that it will not make electric power "dirt cheap."

J. H. Campbell, Vice President of Consumers Power Co., has made the following pertinent observations about the application of atomic power to the generation of electricity:

> . . . two things should be borne in mind. Present methods of producing power are steadily being improved in efficiency, thus accentuating the competitive problem confronting atomic power plant designers.
>
> Furthermore, the successful completion of an atomic plant which can compete economically with methods now used will not mean a drastic reduction in the cost of power in areas where fuels now being used sell at normal prices.
>
> This is so because the principal cost of electric power is the cost of its delivery to the customer, not the cost of the fuel used to make the steam which turns the generators.
>
> We anticipate great possibilities in the atomic power field, but feel its limitations should be faced realistically.

The utility industry looks forward to the generation of electricity by atomic energy as another progressive link in the ever-growing chain of progress.

The imminence of atomic power serves to emphasize the need for a "fair and enlightened judgment" on the part of each regulatory body in its considerations of allowable rates to be charged by utilities. Great sums of capital will be required in the years ahead to finance either conventional or nuclear generating plants. To that end, public utilities will compete with all other business for the investor's dollars. If they are to be successful, then regulation should be modern regulation. Earnings for 1953 should be based on 1953 requirements which urgently need a recognition of fair value and the realization that the expiring plant purchased with "dear" dollars must be replaced with "cheap" dollars.

It is equally important that the Federal government withdraw from its role as an active competitor in the production and transmission of power, or in any business. Taxpaying private enterprises never should be required to compete with government projects subsidized with tax money. Government is the referee and should not run with the ball too. Taxes collected across the nation should not be funnelled into a small area for the benefit of only a few. If you see Uncle Sam handing someone a bouquet, don't think of him as a benevolent gentleman. The chances are good that he picked some of the flowers in your garden.

Accountants have had a major assignment in the regulation of public utilities in the past. Their role today is great and in the future will be even greater. In fulfilling their utility engagements they will be helping assure our country in the years to come of healthy utilities with healthy, flexing utility muscles capable of continuing to show the world that the free-enterprise way is the best way.

A Personal Invitation to Attend the National Electric Heating Conference in Cincinnati

THIS is a personal invitation for all of you in the power sales and the electric heating equipment manufacturing field to attend our heating conference in Cincinnati next month. I say "our" heating conference since it is definitely a joint industry-utility sponsored project under the formal supervision of the Industrial Electrification Council.

The fact that the council has chosen electric heat as the subject of its first activity is indicative of the significance placed on this phase of industrial electrification. Within this sphere presently lies our greatest opportunity for continuing the expansion of power applications in the immediate years ahead. No other activity offers such broad benefits to the electric industry, to electric heating equipment manufacturers, and to purchasers alike.

Sales of industrial electric heating equipment in 1936 totaled 435,000 kw. By 1950, sales were running up 2,000,000 kw per year, and we have only begun to find the places where electric heat can be helpful to industry. If we are to do a good job of helping our customers to use this type of equipment and if we are to get the maximum benefit from our efforts for ourselves, we must have all the know-how we can get concerning the hundreds of electric heat applications. This is the fundamental reason for our conference. Over 50 experts drawn from both manufacturer and electric company staffs will appear on the five-day program.

Ample time for discussion of the many papers which will be presented will be provided. In addition all papers will be reproduced so that you will be able to go home with a complete summary which will be most helpful in bringing your associates up to date. Many ideas for increasing our helpfulness to our customers in solving heating problems will be developed. Undoubtedly some of these ideas will fit into your program and you will want to take them back home and put them to use.

So, remember and plan for the Industrial Electrification Council's National Electric Heating Conference, Netherlands Plaza Hotel, Cincinnati, Ohio, January 18-22, 1954.

—GEORGE DUERR

Electrical Equipment Committee Meeting

A. M. DeBellis, *Chairman*

The Electrical Equipment Committee held its 61st meeting at the Jung Hotel in New Orleans, La., on November 2-3, 1953, with an attendance of approximately 80 members and guests. On Sunday, November 1, committee members were guests of New Orleans Public Service Inc. at a luncheon, followed by an inspection tour of the A. B. Patterson Plant.

The program consisted of the presentation of papers and reports and discussions under the sponsorship of five of the six division chairmen: D. W. Taylor, System and Apparatus Troubles Division; C. C. Farrell, Apparatus and Design Division; C. L. Derrick, Operation and Maintenance Division; H. E. Deardorff, System Engineering Division; and R. J. Hirsch for A. V. DeBeech, Foreign Practice Division. In accordance with its regular procedure, the committee devoted the first day to a closed session for informal discussion of apparatus troubles and other appropriate subjects.

Under sponsorship of the Apparatus and Design Division, J. H. Foote, Chairman of the Electric Light and Power Group of ASA C-37, presented a progress report on the proposed revision of "American Standards for Power Circuit Breakers." In the absence of its author, J. Q. Wray, a progress report on "Apparatus Bushing Standardization" was also read by Mr. Foote.

Under sponsorship of the Operation and Maintenance Division, F. J. Schneider of the Niagara Mohawk Power Corp. presented an interesting and enlightening paper entitled "Fire Protection of Generating Stations and Substations." He pointed out that proper fire protection should provide maximum freedom from loss or interruption of power service by fire or other casualties. Three important aspects of fire protection in generating and substations are (1) engineering design of the station and equipment such that the possibility of fires will be reduced to a minimum; (2) a rigid maintenance program including cleaning, inspection, and testing of equipment to locate weakness before actual breakdown occurs; (3) provision of adequate fire-protection equipment to extinguish while they are in their early stages such accidental fires that do occur.

Oil fires in the lubricating system for steam turbo-generators are particularly serious, not only because of the quantities of oil and pressure involved but also because the oil pump cannot be stopped without serious damage to the machine until the unit comes to rest. Niagara Mohawk has found it beneficial to cooperate with the local fire departments by inviting their officers to visit stations, by exchanging ideas with them, and by showing them all the possible hazards to be avoided if they should be called upon for assistance.

F. J. Schneider also reported on the panel discussion on fire protection conducted by the Canadian Electrical Association at its annual convention in June, 1953.

R. M. Pennypacker presented a progress report on the joint activities of the Insurance and Electrical Equipment Committees. A joint subcommittee has investigated the possible use of self-contained mechanical foam systems for automatically operated fixed systems on transformers at locations where no water supply is available. Tests were conducted at the Plymouth Meeting Substation of the Philadelphia Electric Co. on August 5, 1953, to determine the effectiveness of a limited supply of foam in extinguishing an actual transformer fire. Under the conditions of these tests, the fixed foam system successfully extinguished the fire.

On Tuesday morning, a testimonial scroll was presented to H. B. Wood in recognition of his long and distinguished service to the committee as a member from 1934 until his recent retirement.

Three papers were presented by the System Engineering Division. The first of these, a timely and interesting paper by L. K. Del'Homme and S. L. Rieves, was entitled "System Planning and Development for Houston Light and Power Company" and was delivered by Mr. Del'Homme. This paper will appear in a future issue of the BULLETIN.

The second paper sponsored by the System Engineering Division was presented by W. E. Caven. Entitled "An Interconnection Agreement as an Aid to System Planning," this paper showed how an interconnection agreement can be used to provide savings in the cost of production plant. Such an agreement can make it possible for a relatively small company to install larger and, hence, more economical units than it could afford otherwise; it can further provide substantial savings in fixed costs.

An interconnection agreement negotiated in June, 1950, between Atlantic City Electric Co. and Philadelphia Electric Co. has resulted in mutual savings both in operating and fixed charges and improved reliability of service for both companies.

Atlantic City Electric Co. has a service area of some 3000 square miles, comprising roughly the southern third of New Jersey; it has an unbroken territory extending from the Delaware River on the west to the Atlantic Ocean on the east, a distance of about 70 miles. The diversity of load factor is high because on the Atlantic Coast there is a resort area; in the middle, a highly agricultural area; and in the western sector bordering Delaware Bay, considerable industry.

The third presentation on system planning was made by G. L. Rhodes and very appropriately described the historical background and system planning used by New Orleans Public Service Inc.

Under sponsorship of the Apparatus and Design Division, A. Jenkins, Southern California Edison Co., presented a paper describing hydrogen evacuation of synchronous condensers by the vacuum method. The problem of gassing and degassing hydrogen cooled synchronous machines in a safe and economical manner is of great importance because of the potential hazard involved from an explosive mixture of hydrogen and air. The machines are never operated at less than 95 per cent hydrogen, and generally the purity is 98 to 99 per cent, thus assuring a high safety factor while

in operation. Various methods of scavenging have been used, such as discharging carbon dioxide, opening manholes, and installing fans for 24 hours, or various combinations of these. The hydrogen cooled condensers naturally lend themselves to vacuum evacuation since the shells are sufficiently strong to withstand possible internal explosion or external pressure and there are no extension shafts or couplings to a prime mover which would introduce shaft sealing problems. The following advantages are gained in using the evacuation method instead of scavenging with carbon dioxide.

1. The average time to purge with carbon dioxide is three to four hours and to purge with carbon dioxide and fill with hydrogen six to seven hours, compared with two to three hours when using the vacuum method.
2. It is not necessary to air out the machine for 24 hours after scavenging. This allows quicker entry into the machine and reduces outage time. It is particularly true should it be necessary to open the machine between routine overhauls for an emergency repair.
3. The system creates safer working conditions because at no time does an inflammable or explosive mixture of gases exist. Within the machine, there are no pockets of gas or any gas trapped in the surface insulation of coils or between laminated iron after the 29-in. vacuum obtained during the evacuating cycle.
4. It eliminates the cost of carbon dioxide when removing or filling with hydrogen.

W. F. Wetmore, Chairman of the Light and Power Group of ASA C-50 and of the Subcommittee on Synchronous Machinery of ASA C-50, reported that there had been no meetings during the summer of these groups. However, letter ballots have been sent out on the following sections of the proposed revision of ASA C-50: "Synchronous Machinery," "Induction Motors," "Direct Current Motors and Generators," "Exciters," "Motor Generator Sets," and "Dimensions for Motors and Generators." The Electric Light and Power representatives have reviewed these sections and found them generally acceptable.

R. J. Hirsch of Shawinigan Water and Power Co. presented A. V. DeBeech's report of the Foreign Practice Division. A description of the new 275-kv super-grid transmission system installed recently in England was included in this report.

The next meeting of the Electrical Equipment Committee will be held at the Sheraton-Cadillac Hotel in Detroit, Mich., on February 15-16, 1954.

Meter and Service Committee Meeting

C. V. Morey, *Chairman*

SEVENTY-SEVEN members and guests convened at the William Penn Hotel, Pittsburgh, Pa., on October 19-21, 1953, for the joint meeting of the EEI Meter and Service Committee and the AEIC Committee on Metering and Service Methods. The meeting was devoted to subcommittee reports and round-table discussions concerned with the engineering, economic, and operating aspects of revenue metering.

Chairman C. V. Morey announced that G. J. Yanda had been appointed Vice Chairman of the Meter and Service Committee; that F. A. Salmon had been designated Chairman of Division I, Service Equipment, to replace J. Lineback; and that C. P. Stahl had been designated Chairman of Division III, Codes and Rules, to replace G. J. Yanda.

The morning session on October 19 was devoted primarily to manufacturer presentations of new developments in meters and metering or service-entrance equipment. The luncheon session on October 20 was highlighted by an interesting talk given by P. H. McCance, President, Duquesne Light Co. Entitled "Pittsburgh Rebuilds for the Future," the talk was illustrated with slides showing the tremendous rebuilding program which is transforming the entire appearance of the city.

E. L. Keller reported that he was continuing his investigation of cyclometer registers for watthour meters. All manufacturers have developed snap-action registers, and therefore split readings on all but the first dial have been eliminated. One manufacturer utilizes magnets, and the others depend upon gravity to produce the snap. The numerals are large and the readability good on modern cyclometer registers. There are more friction points in the cyclometer register than the pointer type, and, therefore, over a period of time a greater potential source of trouble exists. The cost of the cyclometer register is higher both when bought as a part of the meter or as a separate item.

A symposium on actual practice being followed in training meter personnel was conducted by S. J. DeLuca. The first paper was presented by C. P. Stahl and discussed the self-training program being followed by Wisconsin Power and Light Co. The men are advised of available material, and training guides are in the hands of the supervisors. In order to qualify for promotion an employee is required to pass a written examination.

The second paper was presented by F. A. Salmon and described training of meter personnel of Central Power and Light Co. of Corpus Christi, Texas. Since this company's territory is rather large, 42,000 square miles, the training program is concentrated in the central meter department. All new employees are hired at Corpus Christi, and a supervised period of training is conducted, including a junior college course in some cases. One-third of the force is sent to a one week course at Texas A & M College each year.

The third paper was presented by E. L. Keller and described the training program conducted by the Duquesne Light Co. All Meter Department employees are hired as metermen apprentices, with a four-month training period. On-the-job training, including by-weekly lectures and demonstrations pertaining to metering, are provided. When a vacancy occurs in the next higher job clasisfication, the man who has bid for the job and who has the highest seniority rating is given an oral and written examination. If he passes this test, he is promoted. Evening study courses at no cost to the employee are available in a variety of subjects.

The fourth paper described training in the New Orleans Public Service

Inc. and was prepared by L. C. Ramon. This company furnishes new Meter Department employees with on-the-job training, including practical demonstrations and class-room lectures on appropriate technical subjects and safety procedures. A manual compiled by the meter department is used as a text for these classes.

The economics of a planned program for meter obsolescence was discussed briefly. It was pointed out that in many companies such programs had been inaugurated shortly before World War II but shortage of materials during the war and Korean incident had made them economically unfeasible. It was agreed to undertake a new investigation of the economics of a planned program of retirement for obsolete meters.

E. H. Walton reported that MSJ-2, "Standard for Low Voltage Metering Current Transformers," is in the hands of the AEIC-EEI-NEMA Joint Committee and will probably be published in the near future. It will be made up of two parts, Part I including indoor transformers in the 600-v class and Part II including indoor-outdoor window-type transformers.

J. A. Morris discussed the results of his investigation into the economics of area versus date testing of watthour meters. An analysis of the answers to a questionnaire on practices being followed by various operating companies and their thoughts on the economics of meter testing showed that no one system is properly applicable to all conditions and that neither the area method nor date method of testing watthour meters is inherently more economical. Specific conditions regarding load concentration, type of area involved, etc., must be taken into consideration. Since the economics of the various meter operations is of pertinent interest to operating companies, it was decided that symposiums on subjects related to this field would be conducted at frequent intervals. The first such symposium will be held at the next meeting and will consist of papers describing actual methods of meter testing being used, economics dictating these choices, and plans for the future. The three initial papers will describe operations in three quite different companies.

The next meeting of the Meter and Service Committee will be held jointly with the AEIC Committee on Metering and Service Methods on February 3-5 at Dallas, Texas.

EEI Prize Awards for 1953

Available to electric light and power companies, groups of their employees, and individual employees, the following Prize Awards, consisting of 33 presentations, are being offered through the Edison Electric Institute for the year 1953:

THOMAS W. MARTIN AWARD

Offered to company contributing most to rural electrification and agricultural advancement in area served.

An Engraved Bronze Plaque Naming the Winning Company.

Deadline: February 15, 1954

LAURA McCALL AWARDS

Offered in recognition of outstanding achievement and originality in the field of home service.

Five Bronze Plaques and Cash Prizes Totaling $1000.00.

Deadline: February 1, 1954

FRANK WATTS AWARDS

Offered to companies most successful in stimulating promotion and sale of electrically operated farm equipment.

Three Bronze Plaques and Cash Prizes Totaling $700.00.

Deadline: February 15, 1954

MORE POWER TO AMERICA AWARD

Offered to recognize achievement in increasing American industrial productivity through industrial electrification.

Two Bronze Plaques and Cash Prizes Totaling $500.00.

Deadline: February 1, 1954

GEORGE A. HUGHES AWARDS

Offered for outstanding achievement in the field of electric appliance sales and promotion.

Six Trophies and Cash Prizes Totaling $1200.00

Deadline: February 1, 1954

PLANNED LIGHTING AWARDS

Offered to companies which have most effectively raised the standard of lighting in their communities.

Six Bronze Plaques and Cash Prizes Totaling $900.00.

Deadline: February 15, 1954

GEORGE WESTINGHOUSE AWARDS

Offered in recognition of outstanding performance in the promotion of electric laundry equipment.

Two Trophies, Two Bronze Plaques, and Prizes Totaling $800.00.

Deadline: February 1, 1954

CLAUDE L. MATTHEWS VALOR AWARDS

Offered to honor acts wherein extraordinary courage was exercised to maintain or restore electric service.

Bronze Medals and $150.00 Awards to Winning Individuals or Groups.

Deadline: February 1, 1954

REDDY KILOWATT ANNUAL REPORT AWARD

Offered to encourage companies to simplify, dramatize, and humanize their annual reports.

Certificate and Bronze Plaque to Winner Plus Honorable Mentions.

Deadline May 10, 1954

Of interest to small and medium-size companies:

1. Both George A. Hughes and More Power to America contests have two classifications: one for companies with 250,000 total meters or more; one for companies with under 250,000 meters.
2. Laura McCall Contest has new subdivisions: one for companies with a home service department employing ten or more assistants; one for companies with departments employing not more than nine assistants.
3. Frank Watts Awards are now presented for achievements in *single projects* in the rural field.

Complete details may be obtained by writing to:

EDISON ELECTRIC INSTITUTE

420 Lexington Avenue New York 17, N. Y.

Personals

W. Alvis Parish, Vice President and Director, Houston Lighting & Power Co., and a Houston, Texas, attorney, has been named President of Houston Lighting & Power to succeed the late **S. R. Bertron,** who served the company as an executive for 38 years, 23 of which he was president and general manager.

Mr. Parish's association with the company began in 1914 when the law firm with which he was an attorney was appointed legal counsel to the company. In recognition of his legal work for HL&P he was elected to the board of directors in 1917. In 1927 he was named vice president, and became a member of the executive committee in 1935.

Mr. Parish, a native Texan, graduated from the University of Texas in 1910 with an LL.B. degree and was admitted to the bar that same year. He is a member of the board of directors and advisory committee of the Second National Bank of Houston, a director of the Houston Terminal Warehouse and Cold Storage Co. and the Southwestern Drug Corp. of Dallas, and a member of the American Bar Association, State Bar of Texas, Houston Bar Association, and numerous civic and social groups.

Subsequent to becoming president, Mr. Parish announced election of **W. J. Aiklen,** Vice Pressident and Division Manager, to Executive Vice President in Charge of Operations, and of **T. H. Wharton,** Financial Vice President, to Executive Vice President in Charge of Finances. Named as assistants to Mr. Aiklen were **P. H. Robinson,** Vice President in Charge of Operations, **F. M. Austin,** Vice President in Charge of Sales, and **Carl B. Sherman,** Vice President in Charge of Insurance, Claims, and Personnel.

Mr. Aiklen first joined HL&P in 1927. He has been a director for 23 years, a vice president for 13 years, and manager of the Galveston Division for 22 years. Mr. Wharton, with the company since 1922, was made comptroller in 1944, a director in 1946, and a vice president in 1949.

T. Cortlandt Williams, Vice President and Senior Construction Manager, Stone & Webster Engineering Corp., has been elected Executive Vice President. He will continue his present duties in addition to assuming the responsibilities of executive direction and coordination of the organization's Boston activities. An engineering graduate from Bucknell University, Mr. Williams joined Stone & Webster in 1923, working in field construction. He was elected to his previous position in 1947 and as a director in 1950.

W. V. Drake, Assistant Vice President, West Penn Power Co., has been elected Vice President, succeeding retired **H. S. Fitch,** who had been with the company for over 40 years.

Mr. Drake, who joined the company in 1921 as assistant to the superintendent at Springdale Power Station, became operating engineer in 1922 and superintendent of mechanical operation in Pittsburgh in 1923. Moving to Monongahela Power Co., a West Penn sister company, in 1928 as superintendent of power stations, he was appointed manager of power generation in 1931, the position he held until transferring back to West Penn in 1949 as manager of power production. He was named assistant vice president earlier this year. Mr. Drake was on loan to the National Resources Commission of China for six months, serving as head of the Technical Mission and investigating plant sites and facilities in north China and Formosa. He was called back to Formosa in the summer of 1952 for a similar purpose. He is a member of the EEI Prime Movers Committee and ASME.

Mr. Fitch joined West Penn in 1913 as an engineer. During the years, he served successively as assistant system operator, system operator, superintendent of electric operations, and general superintendent of substations until being elected to his last position in 1949. He played an important role in the organization of Ohio Valley Electric Corp., formed to supply power to AEC's new diffusion center near Portsmouth, Ohio. Mr. Fitch is a past president of PEA and West Penn Veterans Association, a member of the EEI Enginering Division General Committee, a life member of AIEE, a member of the Engineers' Society of Western Pennsylvania and several other trade and engineering organizations.

P. R. Knapp, General Superintendent, Toledo Edison Co., has been named Vice President. Also, **H. H. Kerr,** Vice President in Charge of Operations, was promoted to Vice President and Executive Engineer.

Mr. Knapp joined Toledo Edison in 1917 after graduating with an electrical engineering degree from Worcester Polytechnic Institute. In 1922 he became head of the Production Engineering Department and in 1924 was made assistant superintendent of electric distribution. He became superintendent of electric distribution in 1933 and was named general superintendent in 1945.

At Southern California Edison Co., **J. H. Mead,** Assistant Vice President, Commercial Department; **E. R. Peterson,** Assistant Comptroller; and **Robert P. O'Brien,** Assistant Vice President, Rate and Valuation Department, have been elected Vice Presidents.

Mr. Mead, who joined the company in 1922, was district manager in Pomona and Long Beach prior to his appointment as assistant vice president in 1950. Mr. Peterson has been with the company since 1926 when he joined it as a trainee from the California Institute of Technology. He was elected to his former post in 1948 after having served as head of the Tax Department for several years. Mr. O'Brien, formerly with the California Public Utilities Commission, joined the company in 1952. He was emergency power director and head of the power division of the commission in 1948.

F. Bayard Culley, President, Southern Indiana Gas and Electric Co., has retired after completing 46 years in the electric industry. Mr. Culley was with Georgia Power Co. and its predecessor, the Augusta-Aiken Electric Railway Co., for 27 years. He joined Southern Indiana in 1934 as executive vice president.

Charles E. Michel, Executive Consultant and member of the Board of Directors, Union Electric Co. of Missouri, has retired after serving the company for more than 46 years. He was a vice president for 16 years.

EDISON ELECTRIC INSTITUTE OFFICERS AND COMMITTEES

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(Terms Expiring 1954)

ERNEST R. ACKER.....Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.
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ROBERT P. BRIGGS.....Consumers Power Co., Jackson, Mich
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D. E. WASHBURN.....Boston Edison Co., Boston, Mass.

(Terms Expiring 1955)

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(Terms Expiring 1956)

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